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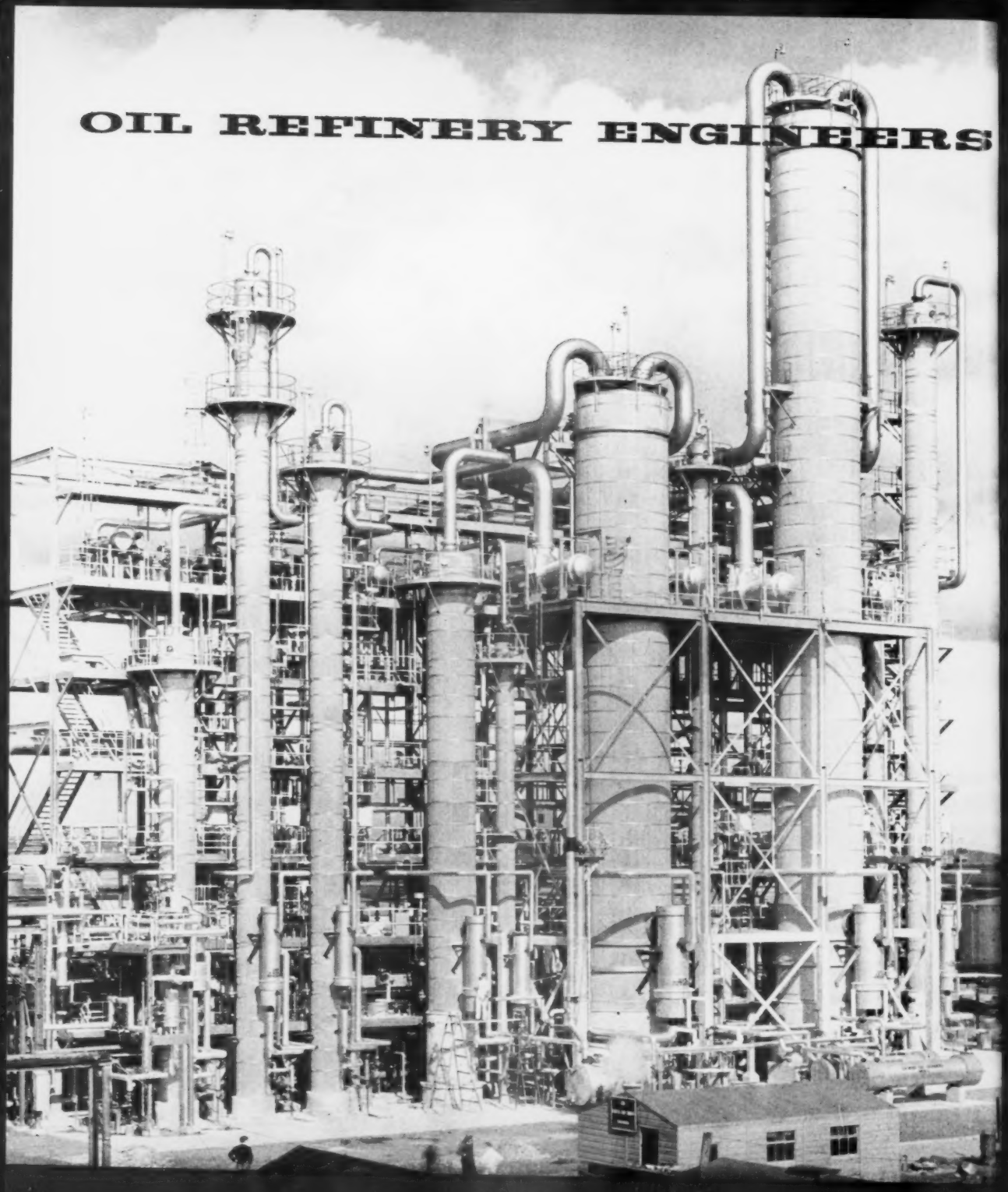

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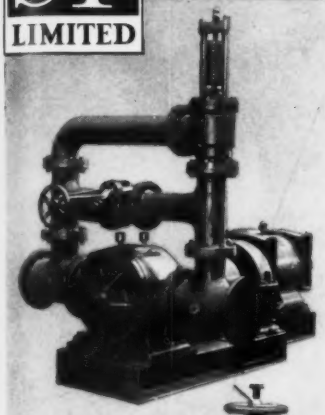
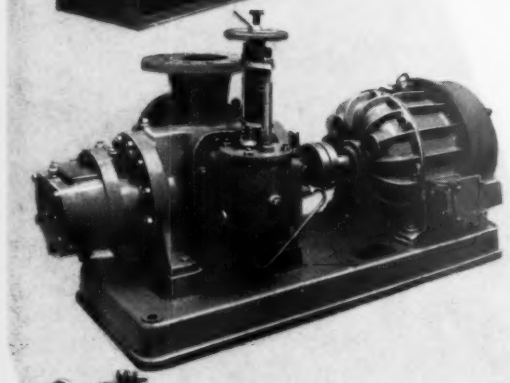
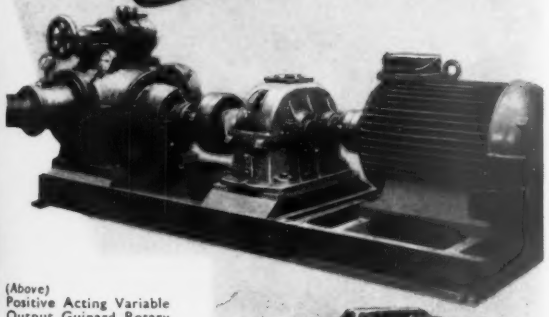


(Left)
Positive Acting Rotary Displacement Pump for the handling of Molasses and viscous fluids, electrically driven through totally enclosed Reduction Gear Box.

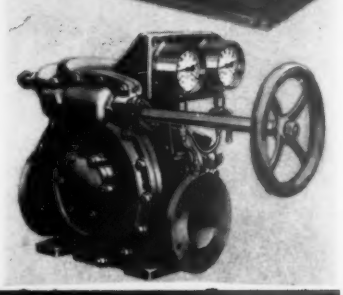
(Below)
Suitable for handling Spirits and other volatile fluids, this Screw Displacement Pump is of the all round clearance design and is capable of working with a high suction lift. The flow is practically pulseless and the unit self priming.





(Above)
Positive Acting Variable Output Guinard Rotary Piston Pump. Electrically driven through Reduction Gear Box, for Oils of varying viscosity.

(Right)
Reversing Flow Rotary Displacement Pump for fitting on tank wagons. These pumps are driven from a power take-off on the gear box.



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REVIEW

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WEST'S PILING at the Isle of Grain

West's Reinforced Concrete Tubular Shell Piles, varying in length from 20 to 70 feet, support refinery units and storage tanks on the Expansion Project at the Kent Oil Refinery of the British Petroleum Company Ltd at the Isle of Grain.

Piling and tank foundation construction in progress for B.P. Refinery (Kent) Ltd on the Isle of Grain.
(Photograph by courtesy of the British Petroleum Company Ltd)

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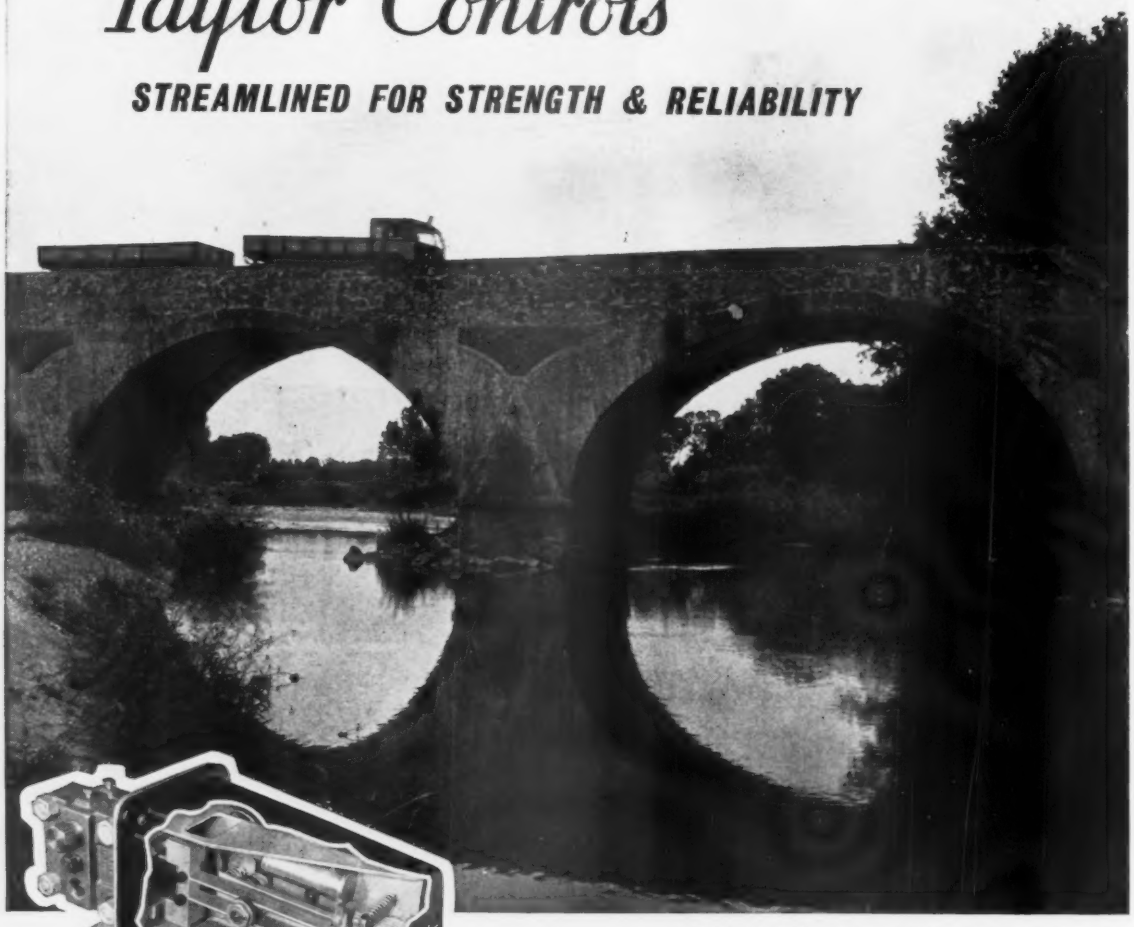

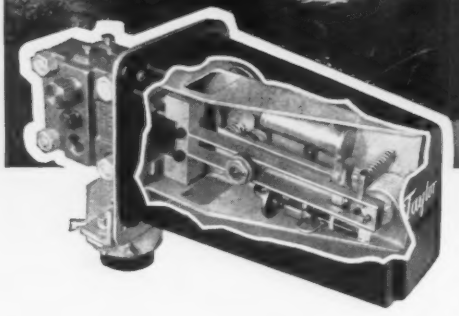

STILL IN USE—Roman bridge on Route des Gaules.
Reprinted from "Oil, Lifestream of Progress."

Taylor Controls also have a long and useful life....
The Taylor Transaire Differential Pressure Transmitter (shown left) is a streamlined lightweight instrument of the force balance type, designed to meet industrial requirements for the measurement of flow, liquid level, specific gravity.

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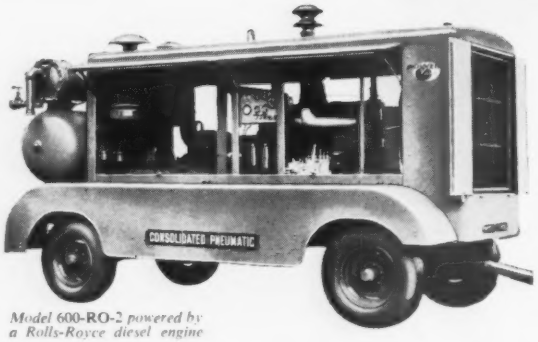

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PRESSURE VESSELS

Illustration (left), shows a mild steel Disengaging Drum 12 ft. internal dia. by 40 ft. long overall, leaving the makers' works in Paisley for Esso Petroleum Co.'s Refinery at Fawley.

The dead weight of the drum is 23 tons.

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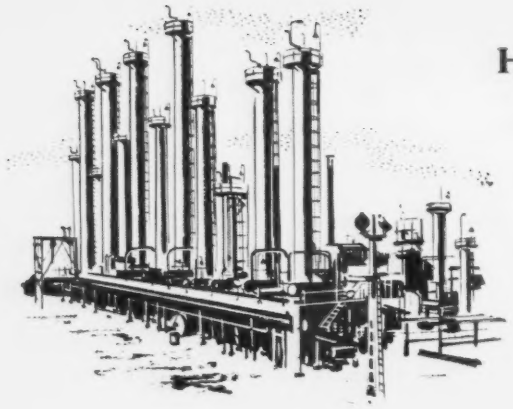

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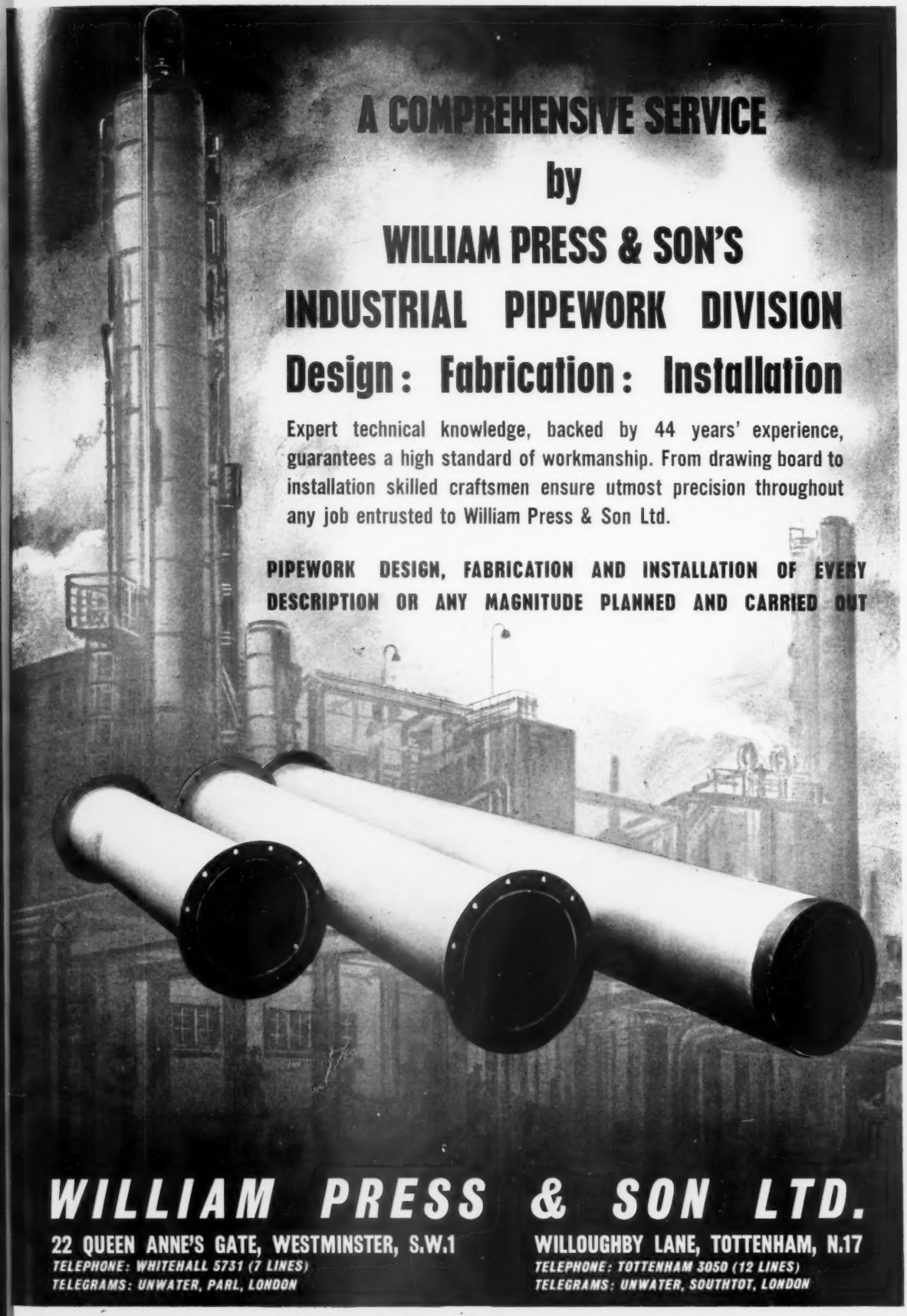

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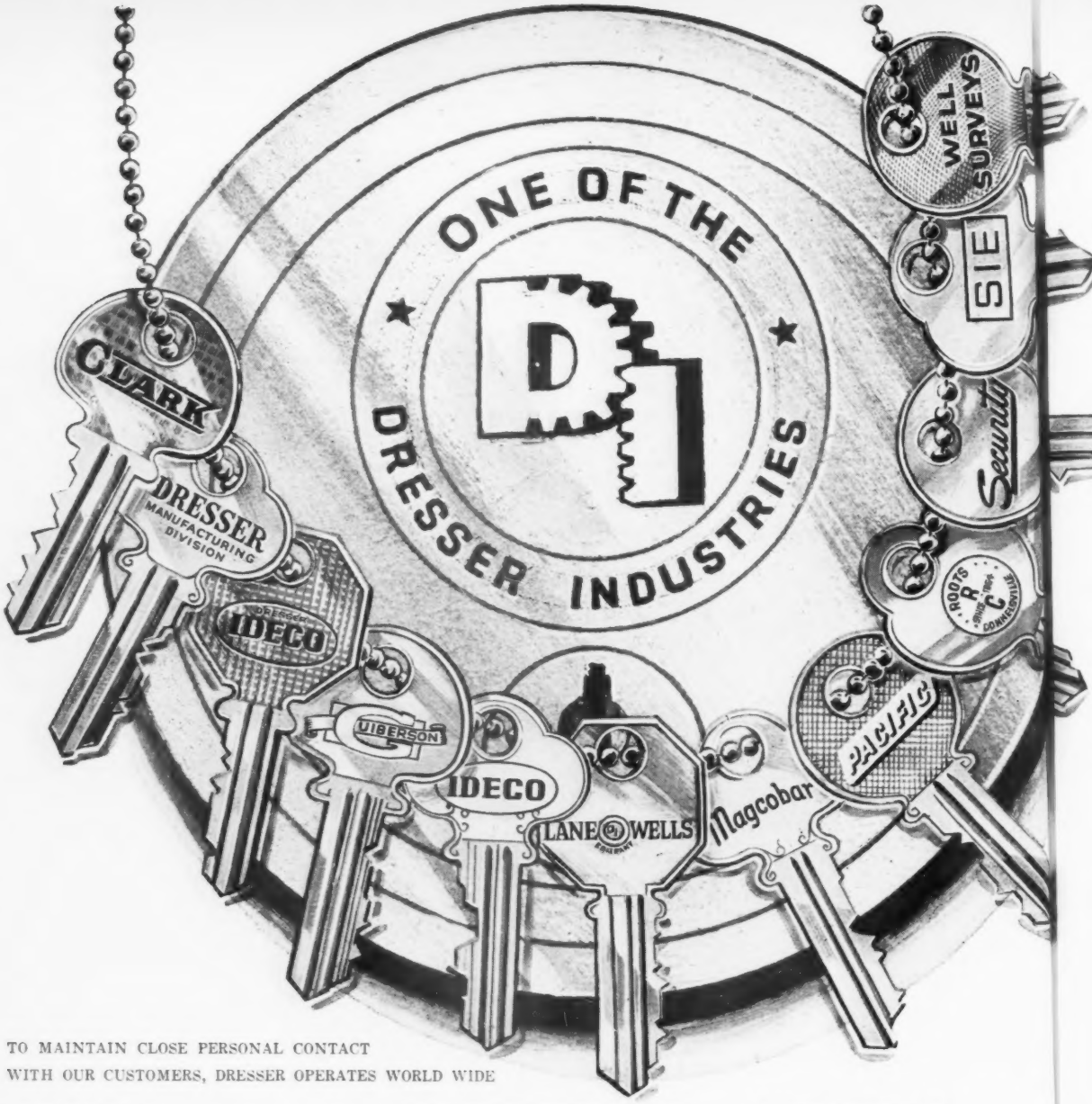

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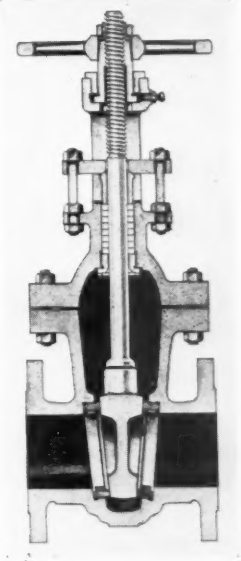
	4	9	15/16	9	6 3/16	1/16	27
	6	11	1	10½	8½	1/16	35¾
	8	13½	1⅛	11½	10¾	1/16	45
	10	16	1 3/16	13	12¾	1/16	53½
	12	19	1¼	14	15	1/16	60¼
CLASS 300	2	6½	¾	8½	3¼	1/16	20¾
	3	8¼	1⅛	11½	5	1/16	24¾
	4	10	1¼	12	6 3/16	1/16	30¾
	6	12½	1 7/16	15¾	8½	1/16	39¼
	8	15	1½	16½	10¾	1/16	47½
	10	17½	1⅝	18	12¾	1/16	56¾
	12	20½	2	19½	15	1/16	63¾



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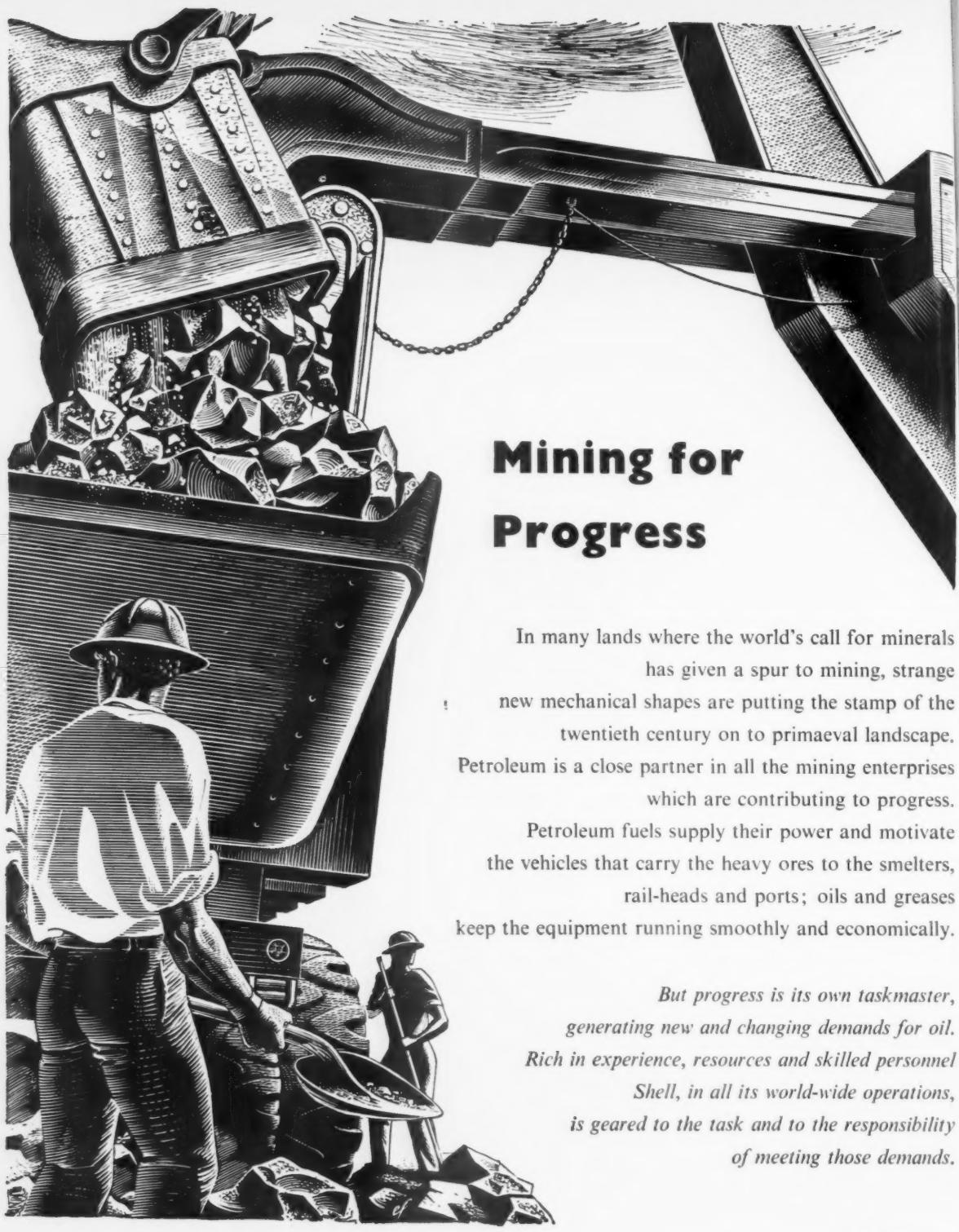

Mining for Progress

In many lands where the world's call for minerals has given a spur to mining, strange new mechanical shapes are putting the stamp of the twentieth century on to primaeval landscape. Petroleum is a close partner in all the mining enterprises which are contributing to progress. Petroleum fuels supply their power and motivate the vehicles that carry the heavy ores to the smelters, rail-heads and ports; oils and greases keep the equipment running smoothly and economically.

But progress is its own taskmaster, generating new and changing demands for oil. Rich in experience, resources and skilled personnel Shell, in all its world-wide operations, is geared to the task and to the responsibility of meeting those demands.

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THE INSTITUTE OF PETROLEUM

REVIEW

Volume 12. No. 133 January 1958

Honorary Editor: E. B. EVANS, M.Sc., PH.D., F.R.I.C. *Hon. Associate Editor:* D. L. SAMUEL, B.Sc., A.R.I.C. *Editor:* GEORGE SELL

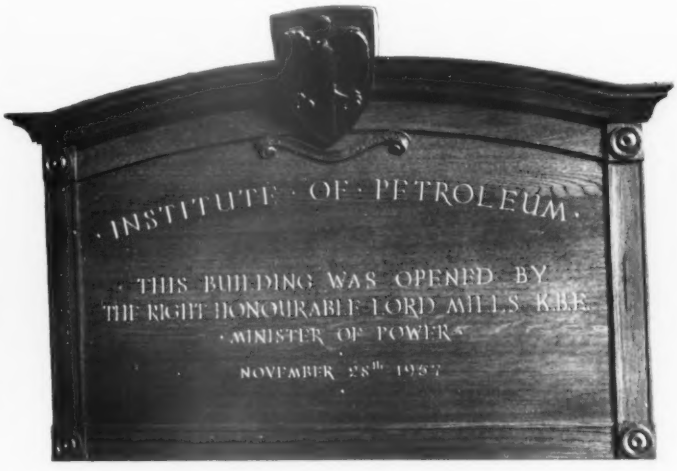
The Institute Enters its New Home

Formal Opening of Permanent Headquarters

In the presence of a large gathering of leaders of the petroleum industry and of Members of Council, the new permanent headquarters of the Institute at 61 New Cavendish Street, London, W.1, were declared open by the Right Honourable Lord Mills, K.B.E., the Minister of Power, on 28 November 1957.

The chair was taken by the Right Honourable Lord Geddes, President of the Institute, and with him on the platform were, in addition to Lord Mills, Sir Stephen Gibson, C.B.E., a past-president of the Institute and chairman of the Building Committee; R. N. Wakelin, the architect of the building; and E. J. Cook, representing Messrs Richard Costain Limited, the contractors.

The plaque which was unveiled by Lord Mills and which will be placed in the entrance hall of the new building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THIS BUILDING WAS OPENED BY
THE RIGHT HONOURABLE LORD MILLS K.B.E.
MINISTER OF POWER
NOVEMBER 28TH 1957

The Rt. Hon. Lord Geddes said:

First, may I welcome you all on this very happy day in the history of the Institute of Petroleum. It is indeed gratifying to see so many illustrious figures from the Services, and from the Civil Service, as well as from the oil industry, here to join us in our celebrations, but before anything else, may I express to the leaders of the oil industry our very grateful appreciation for their generous support which has made this wonderful new home possible.

Since that day in July 1955 when the Council of the Institute trooped around a very dirty and dilapidated building, and unanimously decided that it was suitable for conversion into the Institute's headquarters, a great deal of work has been done, and many difficulties (and not a few crises) have been overcome. That they have been overcome is largely the result of the decision taken by the Council of the

Lord Mills addressing the assembly. Seated are Lord Geddes, Sir Stephen Gibson, and E. J. Cook

Unveiling the commemorative plaque which places on record the opening of the building

Institute at the very beginning to invite Sir Stephen Gibson to be Chairman of the Building Committee, with the simple instruction to raise a building fund, and in due course to hand over a splendid building, fully decorated and furnished and in complete working order!

Sir Stephen cheerfully accepted this task and immediately gathered around him a strong committee who, at their first meeting, took two vital decisions; they appointed R. N. Wakelin as the architect and Messrs Richard Costain Limited as the contractors. In all that has happened since that date, the Institute has looked back with satisfaction to those two decisions.

You may have noticed a little paragraph in the article on the Adam Brothers in the brochure about the building, which suggests that whilst the Brothers undoubtedly had the touch of genius, they did sometimes save a little bit on the contract by using somewhat inferior materials. That is a little bit of history which we can now amply confirm from our own experience!

Mr Wakelin and the Costain Company have done a wonderful job in overcoming a number of most difficult problems that have unearthed themselves (sometimes literally unearthed) and the way in which they have blended the grace of the Adam design with the functional simplicity of the present day is, I think, a very great tribute to their respective skills. In this connexion, too, I should like to mention S. Emery, the foreman of the project, who has done so much to ensure that the building was finished in time, and for his unfailing cheerfulness and helpfulness throughout the construction period.

This new home of ours, which I hope you will find worthy of your Institute, will give us room for expansion in the future. That brings me to the question, just what is the Institute trying to do, and what has it achieved in the past?

Lord Geddes and Lord Mills about to commence a tour of the building

Do you remember the story of a little girl called Topsy of whom little else is known except that she just growed. That really is the story of the Institute of Petroleum, except that its growth was better planned than Topsy's. It was in 1913 that Arthur W. Eastlake and Sir Boverton Redwood conceived the idea of an institute, and from that date on its growth has been brought about by the vision and hard work of a great number of men, some with

names that have become household words in the industry and others who have been content to work in obscurity, who decided to build a great technological institution dedicated to the many sciences which form the petroleum industry.

It grew within the framework of the original conception from its foundation in 1913 until 1938 and then, during Colonel Auld's first term as President, it was decided to open the doors of the Institute to everyone interested in petroleum and, in addition to the scientists, to bring in (and I give these in alphabetical order) the accountants, the administrators, the economists, the statisticians, the hewers of wood, and the drawers of water—in other words, all who find their careers in the length and breadth of the industry, and to change the name from the Institution of Petroleum Technologists to the Institute of Petroleum.

Unfortunately the war made it necessary for these changes to be put in cold storage for six years but since 1945 a start has been made towards the widening of the scope of the Institute with the creation of the *IP Review* (which has grown four-fold during the last ten years), and in the inauguration of the Economics and Operations Group some four years ago.

There is, I am quite sure, much more that the Institute can and should do in this general field, and there is one thing upon which I can assure you all.

Whenever and wherever there are problems in which the Institute can be of service to the industry and to the country, that service will always be most willingly given to the utmost of our ability.

S. Emery, general foreman, E. A. King, managing director, and J. Richards, contracts manager of Kings (B.D.J.) Ltd, all pleased with the results of their labours

R. N. Wakelin, the architect, discusses a feature of interest with Dr E. B. Evans, the honorary editor

You will remember that G. K. Chesterton once wrote:

> *"For men are homesick in their homes*
> *And strangers under the sun,*
> *And they lay their heads in a foreign land*
> *Whenever the day is done."*

For over forty years the Institute has wandered in the wilderness from one temporary resting-place to another, but now at last we are in our own permanent home.

I am sure that you will all agree that on this very special occasion there could be no more appropriate person than the Minister of Power to open this new building and to speed the Institute on this new phase of its career.

Lord Mills, who became Minister of Power in January of this year is also, of course, a member of the Cabinet, and was for many years previously one of our great industrial figures. It is a great tribute to the Institute, and to the industry, that he should have honoured us with his presence here this evening.

I welcome him most warmly, and will now ask him to unveil the plaque commemorating this day, and to declare the building open.

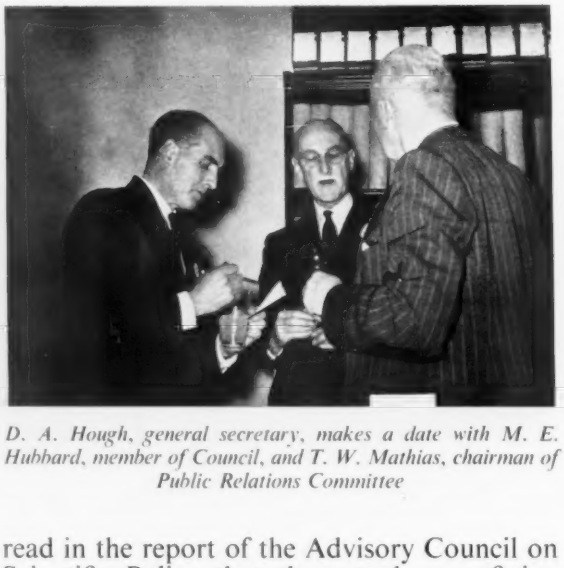
The Rt. Hon. Lord Mills, K.B.E., Minister of Power, said:

I very much appreciate the honour your Institute has done me in inviting me to perform the opening ceremony for your new home. I would like to congratulate you, if

I may, both on your choice of a permanent home and on the care and good taste with which you have restored it to its former graciousness.

I am told that the first owner of this house, in the latter part of the 18th Century, was a Robert Uduley, a West Indian merchant who was elected to the Royal Society for his knowledge of natural history and botany. He was described as "a man of information, great liberality and a very hospitable disposition". I can think of no better way of describing the people who will occupy this building in the future because these are the attributes one associates with members of the oil industry.

G. H. Herridge, joint managing director of Iraq Petroleum Co. Ltd, in conversation with Lord Mills



D. A. Hough, general secretary, makes a date with M. E. Hubbard, member of Council, and T. W. Mathias, chairman of Public Relations Committee

It is more than 40 years since Sir Boverton Redwood and his colleagues saw the need for a learned society of people interested in promoting the technological development of petroleum, and which would cover the whole range of the industry's activities from the oilfield and the well through the pipeline, the tanker, and the refinery to the petrol pump.

Oil consumption in this country in those days was only about 2 million tons a year. Although, even by that time, much progress had been made, the layman's idea of the oil industry was still largely based on his experience of what he called paraffin oil and of the 2-gallon petrol can.

To-day we are using ten times as much oil in this country as we did then and instead of simple terms such as paraffin oil, our talk is of cat-crackers, reformers, platformers, and so on. In other words, from very small beginnings we have to-day reached a stage where petroleum is not only one of the most important prime movers in industry and transport but is also the major foundation of our modern synthetic textile industry, an important chemical raw material, and an expanding source of heat for the home and for industry.

Initiative and drive have always been and still remain the watchwords in every sector of your great industry. This is true, for example, in your pursuit of fundamental research for new and better products. I was interested to read in the report of the Advisory Council on Scientific Policy that the petroleum refining industry had one of the best records in the country for the percentage of their labour force employed on research and development.

Your initiative is also amply demonstrated in the swift re-arrangement of supplies and services which you achieved during the oil emergency associated with the Suez Crisis at the end of last year. As to-day's date is commemorated in the United States as Thanksgiving Day, it is only appropriate that I should express our warm appreciation of the close co-operation and assistance that was given to us during that emergency by the American oil companies. This was yet another example of the good relations that have

J. T. T. Robinson (E. B. Badger & Co. Ltd) with R. L. Wilson (Kuwait Oil Co. Ltd)

F. E. Wellings and "Paddy" Hayes, both of Iraq Petroleum Co. Ltd, find something to admire

existed for so many years between the oil industries of the United States and the United Kingdom.

The nation is indebted to the many members of your Institute for the advances they have already made possible over such a wide field of activity. In declaring this building officially open, I would like to give the Institute of Petroleum and the oil industry generally my best wishes for the continued success of their endeavours in the years ahead. I have much pleasure in unveiling the commemorative plaque.

Lord Mills then unveiled the plaque to the accompaniment of prolonged applause.

Sir Stephen Gibson, C.B.E., said:

It is my privilege to thank Lord Mills for coming to open our new building. There have been remarkable changes in the state of this building in the last few hours and I can now understand the reply which the Highlander is traditionally supposed to have given to a visitor's comment on the state of the Highland roads. He said: "If you had seen these roads before they were made, you would lift up your hands and bless General Wade". In addition to the contractor I think we should also thank our general secretary, D. A. Hough, because I must say that I feel it is a combination of the two which really got us in to this lecture theatre to-night for this ceremony. The renovation and modification of a building such as this has brought up a good many problems and there have been some anxious moments. Now we can say that it is finished except for a certain amount of clearing up.

One of the important parts of the building is this lecture theatre in which we are at the moment. When we were looking round for a house to become our headquarters we looked at many buildings. We considered building a new one, but the cost of that was rather heavy. When we selected this particular house, the one point which influenced me a great deal was the possibility of converting the very spacious kitchens into a lecture theatre,

At the second reception the guests, some of whom are seen to the right and left, were received by A. C. Hartley, C.B.E., a vice-president

because we regard a lecture theatre as being the most important part of our headquarters. The Institute believes in free and full discussion of all the problems which come before it. We have been very fortunate in the last fourteen years in being housed at 26 Portland Place where we have had the use of the lecture theatre of the Royal Society of Tropical Medicine, and we are grateful indeed to that Society for having allowed us to use their theatre. It is, I think, of the greatest importance that we have now achieved a headquarters of our own with its own lecture theatre.

Lord Mills has referred to the growth of the petroleum industry. It has grown a great deal in the last fifteen to twenty years, but I think we might consider how the Minister's responsibilities have also grown. It is almost exactly fifteen years since the Ministry of Fuel and Power was first formed with Major Lloyd George as the first Minister. Since then the responsibilities of the Minister have grown at least five-fold and the industry is more or less keeping its place in that growth. The one difficulty which I am sure the Minister has experienced is that his available time has not grown proportionately. So we are very grateful indeed to Lord Mills for finding time to come to-day to open this building and on behalf of the Institute I would like to thank him for having done so. Sir, on behalf of the Institute and all its members, I thank you.

The Rt. Hon. Lord Mills: Thank you, Sir, for your very kind words. I always try to look at both sides of the question. I would like to give you the other side as put forward by a coloured girl:

"An den der will be Hell"

Dere's some folks claims dere ain't no hell
Like the good Lord's Book do say;
But all you people listen well,
To what I preach dis day.

'Cos Brethren, I'm just going to show,
To all dem foolish liars,
Dat dere'll be hell down here below,
Just everlastin' fires.

When de good Lord made this world go round
By constantly rotatin'
He put some oil down in de ground
To serve for lubricatin'.

He put dat oil deep in de ground,
An' put an awful lot,
So while dis world goes round and round,
Its axis won't get hot.

Den rich folk come and dug a well,
And found de good Lord's store;
Dey took that oil away to sell,
An' searched around for more.

An' so dey've gone on day by day.
Since de time dey dug dat well,
Dey've took de good Lord's oil away,
An' dey sure will give us hell.

'Cos pretty soon dey'll have de lot,
Dey shows no moderation,
An' den dis world will get red hot,
From lack of lubrication.

An' so, dear folks, dis truth I tell,
Dere soon must come a day,
When on dis earth dere sure be hell,
When de oil's all took away.

RUTH L. BRYANT

Now you know why I have got a second string to my bow and why I am also backing nuclear power.

The guests were then invited to a reception in the Library to inspect those rooms, including the Council Chamber, and Committee Rooms, the Library, and the Reading Room, which were completed. A second reception was held on 29 November when representatives of the petroleum and allied industries were received by A. C. Hartley, a vice-president of the Institute. It is hoped that a fully illustrated account of the new premises will be published in the IP REVIEW *in March.*

ENGINEERING ASPECTS OF LUBRICATION

An intensive post-graduate full-time course of 28 lectures on the engineering aspects of lubrication has been organized by the Department of Mechanical Engineering of Imperial College of Science and Technology, South Kensington, London, S.W.7.

About half the lectures will be on the theory of fluid film and thin film lubrication, the remainder dealing with materials normally used. The properties of natural and synthetic oils and additives, greases, and solid lubricants will be considered together with their applications, test procedures, and specifications.

The course starts on 27 January and ends on 14 February. Details and application forms can be obtained from the Deputy Registrar, City and Guilds College, Exhibition Road, London, S.W.7.

RHEOLOGICAL TECHNIQUES

The Battersea College of Technology is to hold a series of 10 evening lectures on Rheological Techniques starting on 21 January.

The course is suitable for chemists and physicists and the emphasis throughout will be on the theory of experimental methods leading to absolute measurements of stress and strain. Examples of instruments and results will be drawn from a wide range of industries.

Enrolment forms are available from the Secretary, (Rheological Techniques Course), Battersea College of Technology, London, S.W.11.

*Some Aspects of the Economics of Tanker Design**

By **D. G. L. BEAN**†

The paper does not deal with the more eccentric proposals of tanker design that have been made during the last year or so. However it should be mentioned that, after some brief and rather empirical investigations, the BP Tanker Company has reached the conclusion that none of those proposals, such as nylon or reinforced plastic containers towed by tankers or special towing craft, even if practicable from a structural or operational point of view, can be expected to compete with conventional tankers as they are likely to be developed in the future. Submarine tankers also are not considered although it is possible that more will be heard of them.

Confining its attention only to the conventional tanker the paper examines how it is constructed, what latitude exists within which the designer can work, and what bearing this is likely to have on the cost of delivering oil by sea.

Steel is the material used in building a tanker and the fundamental aim is to make economical use of the material in the design of a structure which must be capable of withstanding the stresses which will be imposed on it by various conditions of loading and ballasting, combined with the worst weather conditions likely to be met in service.

The tanker differs from other types of large sea-going vessels in that over the greater part of its length there is only a deck and a single bottom. The greater proportion of the bending stresses encountered are borne by the deck and bottom plating, and it is in effect a "stressed-skin job". This, of course, is due to the nature of its cargo which, being liquid, does not need intermediate decks for its stowage, nor inner bottoms supporting it clear of the framework.

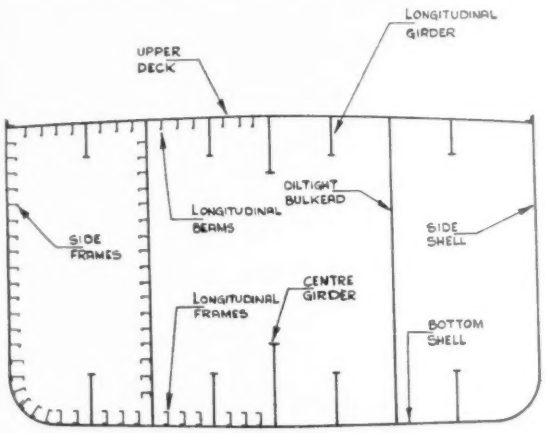


Fig 1. *Typical midship section of a modern tanker*

The side shell plating and framing bears a reduced proportion of the bending stresses and its major function as a strength member is to resist shear stresses and hydrostatic pressure.

Fig 1, a typical cross-section through the middle of a modern tanker, shows the form of construction. In this example there are two oil-tight divisions, called longitudinal bulkheads, which separate the cargo space into one centre and two wing compartments. The purpose of the bulkheads is to limit movement of the liquid cargo when the ship rolls and to add to the longitudinal strength of the ship. Further longitudinal strength is provided by the centre and side girders and the longitudinal framing.

The stresses experienced in still water are small compared with those in waves. The worst condition is when the ship is head-on to waves of length equal to its own length. This is the condition, therefore, for which the bending moments are worked out as a preliminary to decide on the scantlings, (*i.e.* sizes and thicknesses) and the disposition of the longitudinal strength members. When the wave has its trough at the middle of the vessel's length the ship will tend to sag and when the crest is at the middle of the length the ends will tend to droop, and the ship is said to be hogging. Fig 2 shows that in the sagging condition the bottom will be in

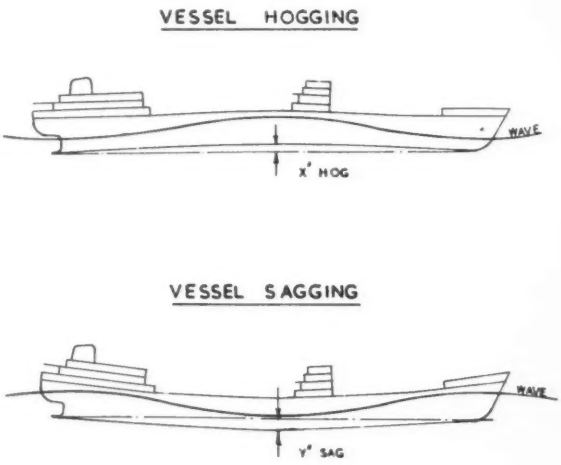


Fig 2

* Read at a meeting of the IP Economics and Operations Group on 15 October 1957.

† BP Tanker Co. Ltd

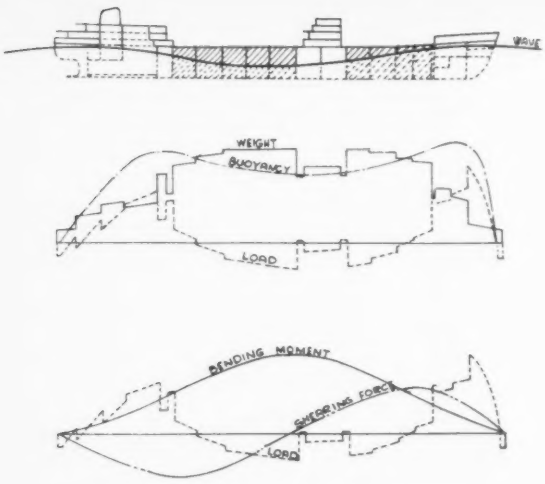


Fig 3. *The longitudinal strength calculation (Drawn for sagging condition)*

tension and the deck in compression; in hogging, the tensile and compressive stresses will be reversed.

A detailed bending moment calculation based on loading and buoyancy diagrams gives the tensile and compressive forces, and sufficient longitudinal material is provided in the deck and bottom to keep the resultant stresses within safe limits.

Sketches of a partly loaded ship on a typical wave profile and simplified loading and buoyancy curves are shown in Fig 3.

In some places along the length the buoyancy exceeds the weight and in others the weight exceeds the buoyancy, but for the ship to be in equilibrium the total buoyancy must equal the total weight. Therefore the area under the weight curve must equal the area under the buoyancy curve.

The difference between the weight and buoyancy curves at any point along the length is a measure of the load at that point; from these loads can be calculated the shearing forces (*i.e.* the tendency for the structure to break), and the longitudinal bending moment which has its maximum value at or near amidships.

As the length of tankers is increased greater tensile and compressive forces in the deck and bottom are involved and plate thicknesses and longitudinal stiffening must be increased to keep the stresses within safe limits.

Other steps which can be taken in the design of the vessel's structure to keep the stresses as low as possible include:—

(a) Making the depth of the ship as large as reasonably possible in relation to its length. There are limits to the extent to which the depth can be increased due to its effect on draught but, in general, a deep ship will be stronger longitudinally than a shallow one and deck and bottom plating thickness for a given size can be less.

(b) Making the proportion of the length of the ship which is devoted to cargo as great as possible. This is essentially a question of the loading of the ship and the distribution of a given load more evenly over its entire length, thus reducing its bending moment. Even if a more lengthy cargo space is provided, however, it may still be possible to load the cargo badly by concentrating it near the middle. It is for this reason, among others, that in large tankers some owners ask for certain of the tanks in the cargo space to be disconnected from the cargo pumping system so that they can never be filled with cargo. The positions of these tanks are chosen so that in the loaded condition the vessel will have the lowest practicable sagging moment, the sagging condition being that in which the greater stresses are met.

(c) Introducing additional longitudinal girders.

As the thickness of deck and bottom plating in tankers of 65,000 to 70,000-dw tons has to be about 1½ inches, and as this is about the maximum which can be conveniently handled with present techniques, for ships of more than about 70,000-dw tons some further means need to be found of increasing the deck and bottom strength without increasing the plating thickness. The answer appears to be the fitting of doubling plates, which can be welded or riveted to the deck or bottom strakes extending over most of the cargo space length. Unfortunately doubling plates, especially over such great lengths, are rather suspect because there is always the danger that unobserved corrosion may take place between the two layers of plating and it is difficult to ensure accurate fitting over the full width of the doubling plate.

In very large tankers, *i.e.* of substantially more than 100,000-dw tons, the fitting of doubling plates may not be sufficient to provide the necessary longitudinal strength and consideration may have to be given to the installation of a second deck and an inner bottom.

It seems likely that in considering increased sizes in relation to structural arrangements, assuming that dry-dock availability and facilities at terminal ports would not affect the matter, there may be definite stages at around 70,000-dw tons and something well over 100,000-dw tons where consideration would have to be given as to whether to carry a comparatively small amount of additional cargo would be worth the structural difficulties involved.

The factor which has had the greatest effect on the economics of structure design has been the replacement of riveted by welded connexions which began during world war II as a method of speeding up deliveries of ships and has been thoroughly developed by nearly all shipyards since 1945.

The introduction of welding has resulted in an appreciable saving in steel and in an 18,000-dw tons ship the saving is about 700 tons which means, of course, that 700 tons additional cargo can be carried on each voyage.

The reason for the saving in weight is that joints which previously had to be overlapped and riveted can now be butt welded. Similarly the riveting flange which had to be provided on frames and stiffeners can now be dispensed with. This is illustrated in Fig 4.

Welding of course has its disadvantages, the most serious being:—

(a) By the very nature of its application welding tends to set up stresses in the steelwork. The edges of the plates or bars being joined are made so hot that they become fluid. When they solidify and commence to cool down, a contraction begins to take place in the edge but not in the adjacent material of the same

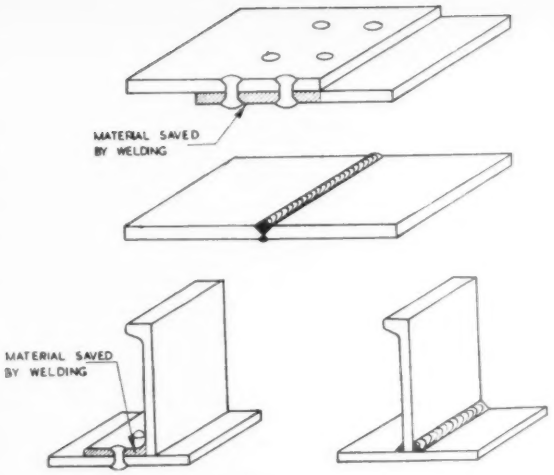


Fig 4. *The difference between riveted and welded joints*

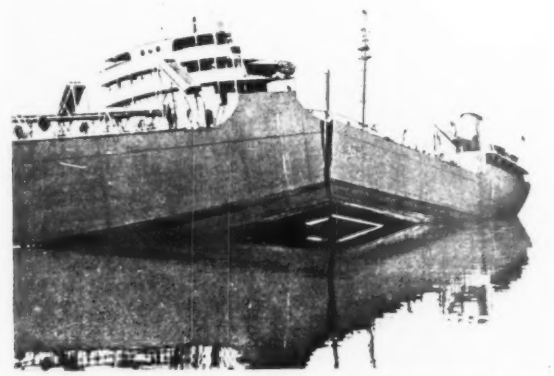
plate or bar. This can obviously become of serious import, especially in very long welded connexions, and while careful structural design and special procedures can be adopted to reduce the "locked in stress" effect it cannot always be entirely eliminated.

(b) If, for any reason, a crack develops in the shell plating of a welded tanker it could run completely around the ship just as a crack in a window pane will extend right across the glass. That this can happen with all-welded ships is indicated by the *Schenectady*, in Fig 5.

It is significant that this vessel fractured alongside the jetty in still water before going into service. This illustrates the amount of "locked in stress" which can accumulate.

Just as the crack in a window pane can be prevented from extending too far by drilling a hole at the end of it to form a positive stopper, similarly in tanker construction crack arresters can be provided by fitting riveted overlaps at certain strategic positions and it is now usual to do this.

Fig 6 illustrates suitable positions for the riveted crack arresters. A crack developing in any part of the shell or deck plating would not be expected to jump the riveted seams unless extremely severe conditions were experienced.



Photograph by American Bureau of Shipping

Fig 5

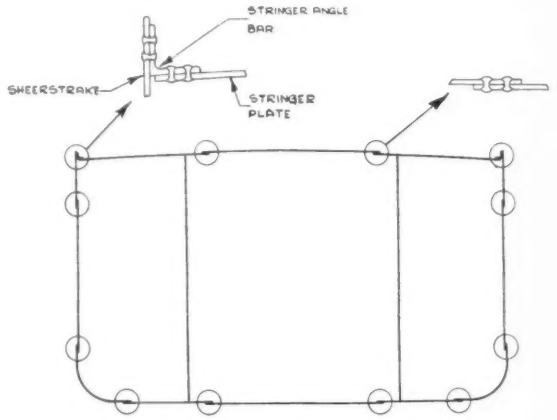


Fig 6. *The relative position of crack arresters*

Fig 7 shows *British Bulldog* after she had suffered a serious explosion. Primary fracture in the decks has been prevented from extending across the width of the ship by the riveted seam.

Certain steels which are less prone to fracture have been developed in recent years and these are now used on large vessels in the most important places. They are not used throughout the ship because of their high cost and shortage of supply. In some cases very tough steels are used as replacement for riveted joints.

As long as demand remains for conventional tankers the need to build in sufficient strength imposes a number of minimum requirements in terms of design. Variations are possible within these requirements, *e.g.* steel weight can be reduced slightly with a corresponding increase in carrying capacity by introducing corrugated bulkheads which can also be expected to be somewhat cheaper. Fig 8 shows the form these take.

There is some hesitation about using corrugated bulkheads among more conservative owners on account of doubts caused by the frequency of minor fractures in earlier designs. However, corrugated transverse bulkheads in smaller sizes of tankers are generally regarded as satisfactory and some owners have built tankers with both transverse and longitudinal bulkheads so constructed.

Some economy in capital cost can also be achieved by construction with minimum scantlings permitted by the responsible classification society, but it is common for owners to specify a margin above the minimum partly to ensure additional safety and partly on the grounds that subsequent steel renewals at classification surveys will be smaller. With the introduction of cathodic protection, which should considerably reduce steel loss due to corrosion, the case for deliberately making scantlings heavier than the required minimum is more difficult to justify. With large and very large tankers

Fig 7

plate thicknesses need to be so great that the scope for a margin above minimum needs is much reduced.

Similarly, the standard of accommodation and crew amenities of various kinds can materially affect capital cost and also, to a proportionately much smaller extent, the weight of the ship and hence its cargo carrying capacity.

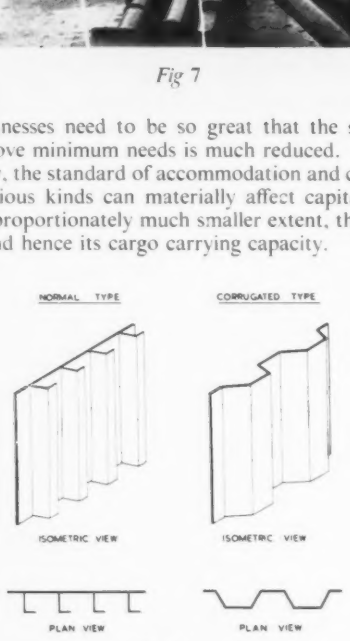


Fig 8

Elements of Tanker Economics

Three of the most important factors governing the cost of transporting oil by sea are: capital cost; dimensions, power, and speed; and type of propulsive machinery.

Capital Cost

As a generalization it can be stated that, built to the same sort of standards, the larger a tanker the cheaper it is in terms of cost per deadweight ton.

This is illustrated in Fig 9, the main reasons of course being that the steel weight per deadweight ton and the cost of deck houses, pipe systems, auxiliary machinery, air conditioning, etc., do not increase in proportion to size. With very large tankers, however, the extra plate thicknesses involved

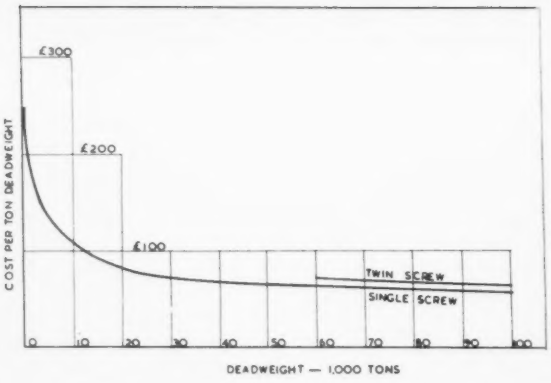


Fig 9. *Building cost of tankers per deadweight ton*

and the special strengthening measures which may have to be resorted to tend to mean that the advantage of size in terms of capital cost per deadweight ton is relatively slight in sizes above about 50 60,000 tons. At the size where twin-screw propulsion becomes necessary or is preferred by owners, the cost per deadweight ton rises sharply and this too may imply that, in general, tankers will not exceed about 70,000-dw tons until the availability of suitable facilities and other considerations permit a general move to something in excess of 100,000-dw tons.

In considering a graph of this kind it is well to bear in mind that the figures shown are based on U.K. price levels at the beginning of 1957, which have gone up appreciably since then. Indeed the cost of building tankers in Britain has increased by about 50 per cent over the last five years and this trend seems likely to continue. The figures shown are therefore merely relative.

Dimensions, Power, and Speed

These three factors are closely interconnected and a word of explanation of the main considerations involved is useful.

The resistance to the movement of a ship through the water can be split into two main categories, frictional and residuary resistance.

Frictional Resistance is a function of the tangential forces of the water adhering to the vessel whilst in motion and varies directly with the wetted surface area and with approximately the square of the speed (in the range of speeds likely to be involved). Frictional resistance increases quite rapidly with speed and of course is also affected by the condition of the hull surface.

Residuary Resistance includes eddy making behind any unfairness in the hull, such as plate edges (much reduced since the advent of welded hulls), pressure resistance arising from the flow of an imperfect fluid around the hull, and air resistance, which is self-explanatory. These are relatively unimportant, however, compared with the most significant element of residuary resistance, namely wave making.

Fig 10 illustrates the pattern of waves set up by virtually all types of ships and which is known as the Kelvin wave pattern. The wave pattern of both bow and stern systems can be clearly seen. Wave-making resistance varies with the

Photograph by AP Reuter

Fig 10

displacement of a ship provided that the speed/length ratio is constant.

Fig 11 shows a typical example of wave-making resistance RW and frictional resistance RF plotted on two axes representing resistance and speed. The basic formula for wave-making resistance includes the cosine function, hence the shape of this curve which is significant when integrated with the curve of frictional resistance to give the total resistance curve RT. This curve enables suitable speeds to be selected at points where the steep portions commence, thus getting maximum additional speed with minimum extra penalty in the form of increase in power for increase in speed.

In the initial design stages various empirical formulae can be used in order to make a first shot at the degree of fineness of the hull form which will be compatible with the speed and length envisaged for the ship. One of the better known of these is the Alexander formula which is used to determine the block coefficient and is shown below.

$$\text{Block coefficient} = \frac{1{\cdot}08 - \text{Speed in knots}}{2\sqrt{\text{Length in feet}}}$$

The block coefficient is the ratio of the underwater volume of a ship to the volume of a rectangular shaped block of the same length, depth, and width.

The terms of this formula make it clear that a fast ship must have a fine hull form, *i.e.* a smaller block coefficient, but that a long ship can be fuller than a short ship for the same speed. This is why modern large tankers can be economically driven although they are of such bluff shape. Their length is quite large in relation to their speed, therefore their block coefficient can be high and this gives a bigger displacement enabling the ship to carry more cargo within given dimensions.

Within the limits that may be dictated by outside considerations such as canals, locks, etc., the other dimensions, *i.e.* breadth, depth, and draught, must be decided having regard to their effects on resistance, seaworthiness, stability, and strength. Breadth is the factor which has the greatest effect on stability; a very narrow ship could be unstable but a too wide ship would have a very violent rolling action. The ratio of breadth to draught has an effect on the resistance of the ship; this also must be borne in mind when fixing the dimensions. Having settled the leading dimensions the next step is to make a preliminary estimate of the power required for a given speed and various ways of doing this are enumerated below:—

(a) By data collected from experience gained on past vessels. This is only of value when data is available for ships of similar size to the one being designed.

(b) By the results of standard series model tests carried out by various authorities. Generally this method is to obtain the wave-making resistance from a series of model tests and to obtain the frictional resistance by means of various frictional coefficients.

(c) By carrying out tests on a specially made model. Of all the methods used for ascertaining the horse-power required to propel a ship at a given speed this is the most satisfactory.

A rule-of-thumb guide to the powering of ships is that the power varies as the cube of the speed. Thus to drive a given vessel twice as fast one needs eight times the power and therefore eight times the fuel consumption per day which equals four times the consumption per mile. It must be emphasized that this "cube" rule is only approximate and in certain circumstances the 4th power may have to be used. On the other hand, at slow speeds some lower rate of power increase may be applicable.

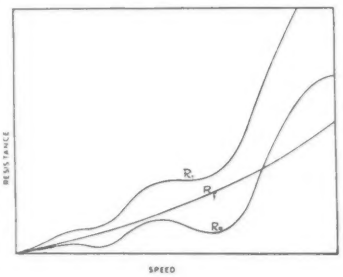


Fig 11. *Curves illustrating the components of resistance*

The increased power for the faster ship entails a larger machinery weight and as more bunkers must be carried the ship has to be larger to transport the same weight of cargo. This position is aggravated because, as mentioned, there is a degree of fineness of form appropriate to the speed and the dimensions would have to be further increased to provide the requisite displacement with the finer form. The increased dimensions themselves entail a higher hull weight.

To illustrate this point more clearly the characteristics of two ships each designed to carry about 50,000 tons of cargo and each having a steaming radius of 10,000 miles but with different service speeds, *i.e.* 12 and 18 knots, have been investigated. The principal particulars shown in Table I indicate the increase in size and horse-power required for the higher speed. It is not suggested that either of these would be a particularly satisfactory design.

As it is believed that the maximum power that can be applied to a single screw is in the region of 20/25,000 s.h.p., it has been assumed that the 18-knot ship would have to be equipped with twin screws. This of course tends to exaggerate the differences between the two ships.

In the case of finished-product carriers, limitations normally exist at the ports where products are to be loaded or discharged in terms of length, breadth, or draught or a combination of all three. The result is that the general-purpose carrier is normally a tanker in the range 14,000 to 20,000-dw tons.

TABLE I

Speed, knots	12	18
Length between perpendiculars ...	725 ft	780 ft
Moulded breadth	97 ft	105 ft
Moulded depth	54 ft	58 ft
Summer draught	40 ft 6 in	43 ft
Block coefficient	0·855	0·75
Displacement, tons	69,500	75,000
Deadweight, tons	53,000	56,000
Service s.h.p.	8000	30,000
Bunkers, tons	2200	5400
Cargo, tons	50,400	50,200

The same limitations apply in many cases to the larger crude carriers but to a lesser degree. There is scope at newer or projected terminals for providing loading and discharging facilities to suit the largest vessels likely to be built. Even so the existence of limiting factors such as the maximum draught at which vessels will be able to transit the Suez Canal renders more complicated the evaluation of the economics of size.

Whatever the size, however, there is considerable scope for variety in dimensions and power and, in general, within limits, the slower the ship the more cheaply it can carry its cargo from port to port. The cargo it can carry during a year however is also of importance chiefly because of the high capital cost involved, which varies comparatively little with speed. Companies have differing ideas on how depreciation and interest should be treated in freighting cost calculations but obviously the incidence must be higher per ton of oil if the cargo carried per year is less.

This is illustrated in Table II which shows a comparison of the two ships mentioned previously, carrying about 50,000 tons of cargo, and a third intermediate-speed ship.

The voyage Persian Gulf Santos has been used merely to avoid complications arising from limited draught in the Suez Canal.

It will be seen that (the figure for a 12-knot ship being taken to equal 100 in each case) the slowest ship has the lowest operating cost but the highest figure for interest and depreciation and that these factors operating in opposite directions result in the intermediate ship appearing as the most economical proposition.

TABLE II

Speed, knots	12	15½	18
Approx capital cost (1.1.57)	£3·6 m	£3,67 m	£4·26 m
Annual cargo potential, tons Persian Gulf/Santos ...	257,000	324,000	369,000
Comparative freight cost per ton of oil			
Operating cost only	100	114	150
Allowance for interest and depreciation	100	81	82
Operating cost plus interest and depreciation	100	98·5	118

Table III shows another example relating to a much smaller ship, which needs to be designed for service which imposes limits of about 550 ft on overall length, 70 ft on breadth, and 30 ft on summer draught, the calculations being based on motor vessels burning marine diesel oil.

Variations in speed for ships within the specified dimensions result in considerable differences in block coefficient and hence in deadweight. In this example the eventual cost per ton carried is lowest for the slowest ship and indeed the cost of the extra oil carried by even the 13½-knot ship is relatively high, though this factor is materially reduced if heavy fuel is substituted for marine diesel oil. However, viewed from the point of view of an oil company building tankers the lower cargo potential of the slower ship implies either the building and crewing of a larger number of ships (for which neither the building berths nor crews may in practice be available) or the chartering of a larger proportion of shipping requirements at an unpredictable cost. If a sufficiently large volume of tanker usage is involved, the additional capital required to meet needs with a slower ship may also be an important consideration, as can the increased commitment in terms of repair, loading, and discharging facilities.

TABLE III

Dimension limits: length 550 ft; breadth 70 ft; draught 30 ft

Ship	(A)	(B)	(C)
Speed, knots	10	13½	17
Service h.p.	3000	6250	12,000
Block coefficient	0·82	0·743	0·665
Summer deadweight, tons ...	18,500	16,000	13,600
Approx. capital cost (1.1.57)	£1·45 m	£1·5 m	£1·6 m
Annual cargo potential, tons Persian Gulf/U.K. ...	96,000	105,000	104,000
Comparative cost per ton of oil carried	100	106	131
Cost per ton carried additional to ship A	—	170	500
	Per 10 m tons oil carried per annum		
No. of tankers	104	95	96
Capital cost	£150 m	£142 m	£154 m

In this and the other examples given, figures are based on the U.K. level of capital and operating costs at the beginning of 1957 and it is perhaps unnecessary to point out that under circumstances where the relationship between capital charges on the one hand and operating costs on the other is appreciably different from that assumed, this could result in appreciably different conclusions being reached regarding optimum dimensions, power, and speed.

Type of Propulsive Machinery

Since the day of the reciprocating steam engine and until quite recently, the choice, for ocean-going tankers, has been between diesel and steam turbine machinery. In practice the former has generally been preferred for tankers up to 16/20,000 tons and steam turbines for larger tankers.

Diesel engines consume only about 65 per cent of the fuel used by steam turbines to produce the same power and with the use of heavy fuel oil the advantage in terms of bunker cost is heavily in favour of diesel propulsion.

Other pros and cons are as follows:—

(i) Apart from lower bunker consumption, diesel ships need to carry less fuel for the same steaming range and thus can transport additional cargo.

(ii) Although the diesel engine is more complex than the steam turbine, a modern steam installation has to be more intricate than its diesel counterpart to achieve economy and hence requires more skilled operation. This is being offset, to some extent, by introduction of automatic controls in steam machinery.

Against the necessity for a high degree of operating skill for steam machinery must be weighed the maintenance commitment in diesel machinery, which increases severely as the size and number of cylinders multiply. This is a serious consideration in tankers owing to the importance of a quick turn round in port.

(iii) Turbine machinery is rather more costly but is relatively light in weight. The space required for turbine machinery can also usually be shorter but is offset by the need for larger bunker capacity, the net advantage depending on the specified steaming radius.

(iv) It is generally believed that turbine machinery is better able to withstand the effect of bad weather, when it can maintain its power in conditions which would necessitate the reduction of speed of diesel engines.

(v) It is probable that over the life of a tanker, machinery repair and maintenance costs with turbine engines will be less than with diesel engines, particularly those burning heavy fuel. The evidence for this however is not at present very complete, chiefly because the average age of steam-turbine tankers (excluding the turbo-electric T2's) is much less than the average age of diesel tankers in service.

(vi) With large and very large tankers, high cargo pumping rates are essential. With turbine machinery, main boilers can be used to supply steam for suitable turbine-driven cargo pumps. To achieve comparable pumping rates with diesel tankers it is necessary to provide large auxiliary boilers or some alternative form of prime mover for cargo pumps.

Calculations of relative freighting costs, even for the largest tankers, show that diesel machinery, burning heavy fuel oil, is the most economical. While this leads to the smaller tanker being in general diesel propelled, the maintenance consideration favours the use of steam-turbine machinery for large installations. In the past it has been customary to undertake a proportion of diesel maintenance with ship's resources during loading and discharging periods but this is growing increasingly difficult, not only through increase in size, but also because the higher grade of marine engineer has a natural preference for the exercise of professional skill in a steam ship rather than physical labour with a diesel.

For these reasons, the majority of tanker owners in Britain favour the steam turbine for horse-powers above about 10,000. Nevertheless in Scandinavia, where the diesel tradition is strong and experience of steam-turbine machinery relatively slight, there is a tendency to build larger and larger vessels with diesel propulsion, engines of as much as 15,000 b.h.p. and 12 cylinders being under construction and even larger sizes projected.

Recent alternative developments include the Pescara free-piston gas generator which provides gases for operating a gas turbine at considerably lower and more manageable temperatures than those experienced with direct gas-turbine installations.

Many advantages are claimed for the Pescara engine but so far experience in service is limited and in general confined to smaller installations. If satisfactory results can be obtained burning heavy fuel over long periods of continuous service, this type of engine should be able to compete with both diesel and turbine machinery of similar horse-power. There is, too, no very obvious reason why by increasing the size of individual generator units (currently about 1000 b.h.p. each) and multiplying their number, installations suitable for the largest tankers should not be developed. Consideration of this type of machinery, and other alternatives such as multiple high-speed diesels or straight gas turbines, is inevitably coloured by the relation of development costs for all possible alternatives. There is a body of opinion which holds that the rate of development of nuclear propulsion is such that it may overtake the other alternatives; this leads to a reluctance to incur heavy expenditure on what may prove to be short-lived projects.

There has been a considerable amount of publicity lately regarding atomic propulsion and it seems almost certain that at least the positive conception of a nuclear powered merchant vessel to be built in the U.K. cannot be long delayed.

It is apparent that to make marine nuclear propulsion attractive the power to be developed should be as great as possible, the utilization factor should be high, there should be room in the hull for a relatively large and heavy installation together with necessary shielding, and it is an advantage to have machinery placed aft and isolated to some extent from crew accommodation.

All these requirements can be met in the design of a large tanker and there is the added advantage that the main tanker terminals are normally fairly remote from centres of population, thus limiting the likely effect of radiation dangers in the event of accident. Tanker crews likewise are used to the rigid safety precautions of their trade, which would only need to be amplified to cope with nuclear propulsion.

The capital cost of nuclear tankers will certainly be very high compared with conventional designs, and machinery weight, including shielding, is likely to be very much greater. This latter disadvantage will however be partly offset by the substitution of comparatively small quantities of atomic fuel for much heavier weights of conventional oil fuel.

Whether in terms of freight cost nuclear tankers can compete with conventional tankers will depend mainly on the cost of nuclear fuel less the credit that can be obtained for fission products that will remain when a charge has been exhausted.

Judging by recent developments in the field of atomic energy, which have been characterized by technical advances ahead of expectations, it can probably be safely assumed that a practical nuclear tanker able to compete with conventional designs from a cost point of view is only just around the corner. There are, however, also a number of problems to be solved in the field of safety and operating conditions to which attention is already being directed.

Conclusion

The paper has only skimmed the surface of the subject and consequently has not touched on a variety of issues such as, for example, the implications on the economics of running

very large tankers, of the capital cost of building new deep water installations, increasing storage, and so on. Such considerations are outside the scope of this paper.

Equally the paper does not draw any conclusions as to the size and design of tankers that the industry should be constructing since this depends so much on the service for which they are intended, and whether they are for oil company or independent ownership.

Discussion

Discussion ranged over a wide field and the following more important points were made.

Mr. Bean stated that for a given horse-power twin-screw propulsion was about 8–10 per cent less efficient than single-screw propulsion; consequently on economic grounds the latter was preferred wherever possible although twin screws improved manoeuvrability. There was, however, a limit of power that could be applied satisfactorily to a single-screw ship. Above that, propeller cavitation, or vaporization of water on the propeller blades, occurred. That reduced propulsive efficiency and might in time damage the propeller itself.

Mr Bean thought the extensive use of large plastic containers for carriage of petroleum towed by tankers or other craft was unlikely to be justified even if the practical problems of design, construction, navigation, loading, and discharge could be satisfactorily and economically overcome.

The accepted policy that tankers should all carry expensive and complicated pumping equipment which was used only for a small proportion of their operating time instead of arranging for shore installations to provide all the necessary pumping capacity was criticized as an uneconomic feature of current tanker design, at any rate in the case of very large tankers which would be forced to shuttle to and from sources of crude oil to a limited range of large discharging terminals.

It was, however, pointed out that in the process of ballasting, de-ballasting, and tank cleaning, a certain amount of pumping capacity would be essential as it might also be under emergency conditions. Furthermore, any feature limiting programming flexibility even of very large tankers was undesirable, particularly as the situation that might exist in the much longer term, when tankers being constructed today would still be in service, was so difficult to forecast.

It was also argued that as it was difficult to see any satisfactory alternative to discharge from hose connexions at deck level the great depth from deck to tank bottom in very large tankers would present a serious additional difficulty in arranging for all pumping facilities to be located ashore.

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MIDDLE EAST PRODUCTION

	October	*Jan.–Oct.*
		Tons
Iraq Petroleum Co. Ltd ...	1,325,440	8,860,086
Basrah Petroleum Co. Ltd ...	840,170	7,148,165
Mosul Petroleum Co. Ltd ...	70,798	412,624
Qatar Petroleum Co. Ltd ...	566,893	5,289,651
Iraanse Aardolie Exploratie en Productie Mij	3,150,000	28,954,000
Kuwait Oil Co. Ltd	5,268,174	46,541,901

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for October was 1,209,000 tons, the total for 1 January to 31 October being 12,959,000 tons.

NEW BRANCH OF BRITISH COMPUTER SOCIETY

A branch of the British Computer Society has been formed at Birmingham.

At the first meeting, a paper "Computers and Modern Society" was presented by Dr A. D. Booth, Head of the Computational Laboratory, Birkbeck College, University of London.

Details of activities of the branch can be obtained from E. C. Lavalette, 10 Cottage Lane, Marlbrook, Bromsgrove, Worcs.

OIL COMPANIES' EQUIPMENT ORDERS

Figures compiled by the Oil Companies Materials Secretariat, and issued by the CBMPE, show that during the third quarter of 1957 orders for materials and equipment placed in the U.K. by oil companies were valued at £35,292,459. Compared with the same period of 1956 there were declines in all groups, with the following five exceptions: equipment for drilling and production; tankage; instruments; ferrous and non-ferrous plates, etc.; and bulk chemicals.

The total figure for the third quarter shows a decrease of £4,155,694 compared with the corresponding period of 1956. The total for the first half year 1957 was £65,993,098 compared with £74,772,895 for the first half year 1956. The total figure for 1956 was £153,680,621.

	1957 *July–Sept.*	1956 *July–Sept.*
	£	£
Geophysical and other exploratory equipment, etc.	15,092	24,321
Specialized equipment for oil drilling and production, including oil casing, tubing, etc.	4,644,404	3,733,971
Specialized equipment for oil refineries, etc. (not including pumps and valves)	985,247	1,586,378
Drum and can-making, filling and cleaning equipment, kerbside pumps and other oil metering and dispensing equipment, etc. ...	103,435	114,474
Railcars, road tankers, aircraft refuellers, etc.	38,825	128,624
Drums, drumsheets, and tinplate ...	1,148,230	1,858,651
Tankage (including tank fittings) ...	2,428,586	1,502,511
Tubulars, pipe fittings, and valves (ferrous and non-ferrous) ...	7,970,325	10,825,746
Pumps, (excluding slush, oil well, and kerbside)	555,174	887,564
Boilers, boiler house plant and accessories, etc.	35,971	610,341
Electrical equipment—motors, generators, transformers, etc. ...	1,834,324	2,010,718
Instruments, meters, and gauges, etc.	388,567	349,768
Prime movers and compressors ...	569,740	743,662
Machine and hand tools, welding and miscellaneous machinery and stores	2,412,642	2,510,601
Ferrous and non-ferrous plates, sections, sheets, and bars ...	1,670,142	1,065,294
Automotive equipment, all types ...	1,187,624	1,455,500
Laboratory equipment and chemicals including hospital and medical supplies	232,482	270,610
Bulk chemicals, catalysts, barytes, etc.	6,059,476	5,629,955
Cement and other building materials and hardware, including timber ...	1,138,448	2,090,078
Commissary, general requisites for office, warehouse, household, club and sports, etc.	1,873,725	2,049,386
	£35,292,459	£39,448,153

Notes of the Month

40 per cent Rise in Standard Oil Expenditures

Standard Oil Company (New Jersey) has estimated capital and exploration expenditures by consolidated companies at approximately $969 million for the first 9 months of 1957. This is an increase of 40 per cent over the same period of 1956. Of the 1957 outlay additions to property, plant, and equipment cost $787 million and other expenditures in the search for oil and gas charged against current income were $182 million. Almost 85 per cent of total expenditure was made in the Western Hemisphere, and about half of that was in the United States.

Consolidated earnings for the 9-month period ending 30 September 1957 were estimated at $660 million or $3·35 per share on the 196,939,278 shares outstanding. This is a 9½ per cent increase over earnings of $603,000,000 or $3·07 per share for the first 9 months of 1956.

In the third quarter of 1957 market demand and prices did not reach expectations and this, together with higher material and wage costs, largely accounts for the indicated decline in earnings for the period.

Income and operating taxes, import duties, consumer taxes, and other payments to the U.S. and foreign Governments were $1,767,000,000 for the first 9 months, compared with $1,582,000,000 in the same period of 1956.

Total income from sales and investments was $6,041,000,000, an increase of $666,000,000, or about 12½ per cent over the comparable 1956 period.

World gross crude oil production was estimated at 2,456,000 b.d. compared with 2,311,000 b.d. for the first 9 months of 1956. Refinery runs averaged 2,464,000 b.d., compared with 2,445,000 b.d. for the same period of 1956.

RSA Award 1957

The Royal Society of Arts has awarded its 1957 Howard Prize for a Treatise on some aspect of the subject of Motive Agents to A. E. Johnson, D.Sc., M.Sc.(Tech.), M.I.Mech.E.

His paper was entitled "Turbine Disks for Jet Propulsion Units: an account of work of the Disk Panel of the Ministry of Supply Gas Turbine Collaboration Committee during the years 1941–49".

Charringtons to Market Mobil Fuel Oils in the Midlands

To meet increasing demand in the Midlands for fuel oils for industrial and domestic purposes, distributing arrangements have been made to market the full range of Mobil fuel oils in the area. These products are now available in Derbyshire, Leicestershire, Rutland, Shropshire, Staffordshire, Warwickshire, and Worcestershire.

Charrington, Gardner, Locket and Company Ltd, which has been distributing fuel for over 200 years, are handling sale and distribution of Mobil fuel oils in this extended area. They have, for the past five years, been marketing the products in sixteen counties in Southern England and in London.

Charringtons have established a Sales Office at Beaufort House, Newhall Street, Birmingham, and a bulk-storage terminal at Bedworth on a 1½-acre site. The Bedworth terminal, which has a tank capacity of 200,000 gal, will be fed by road and/or rail from Mobil's refinery at Coryton, Essex, by Charringtons' vehicles, which will also be used for delivery from the terminal.

Charringtons were pioneers in Britain in using metered tankers for fuel oil deliveries and the same method is retained for delivery to the smaller consumers. Recently they have also brought into operation the first fully automatic fuel oil delivery service.

The Bedworth terminal has three special features.

(*a*) The pipework has been designed to allow doubling of the storage capacity without disrupting deliveries. This extension can be accomplished with the minimum of extra pipework. The site permits three or four times the present storage capacity.

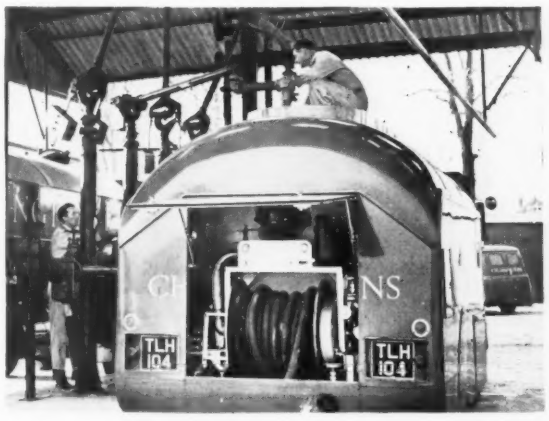
(*b*) The three black-oil tanks are lagged and fitted with steam coils.

(*c*) The measurement of fuels into road tankers for delivery to customers is provided through Brodie-Kent meters, to provide complete accuracy.

Plans have been drawn up for installation of 400 yd of railway sidings, to allow feeding from rail tank cars. The sidings will be capable of handling a whole train load of the new type of 20-ton class B rail tank cars.

Two covered loading positions for Charringtons' road tank vehicles are provided, from each of which vehicles can load any grade of fuel from 3-inch Emco-Wheaton loading arms *via* the Brodie-Kent meters.

The cost of the terminal, for the initial phase, exceeds £40,000, which excludes the railway sidings and rail tank cars and the road-tankers to be based on the terminal.



The loading position at the Bedworth terminal showing a Charrington metered tanker being loaded

BP's Second Hydrofiner Commissioned

The second hydrofiner to come into operation for the BP Group has been commissioned at their Hamburg refinery. The unit can substantially remove the sulphur from 6500 barrels of gas oil a day.

Associated with the hydrofiner is a sulphur recovery plant to produce about 10 tons of sulphur a day.

A unit smaller than that at Hamburg has been operating at Kwinana refinery, Western Australia, for 2 years. Two larger units, one at Kent refinery and the other at Antwerp refinery, are due to be commissioned in 1958.

Start-up of New Catalytic Converters

Following successful tests with a pilot scale unit, The Shell Chemical Co. are installing two full-scale catalytic converters for selective hydrogenation of acetylene and ethylene at their Partington plant.

High-purity ethylene is required for manufacture of polythene, styrene, and synthetic rubber, and ethylene oxide for ethylene glycol, terylene, synthetic detergents, and paint solvents. Acetylene, even in minute quantities, is harmful but can be removed by selective hydrogenation using precious metal catalysts, a new American range of which has been introduced to the United Kingdom. Developed by Baker & Co. Inc., of Newark, New Jersey, they are being made in Britain and are handled by Baker Platinum Division of Engelhard Industries Ltd, 15 High Holborn, W.C.1.

The catalysts can operate at high throughputs and can be regenerated *in situ* when their activity falls below a certain level.

Development of the Lubricated Taper Plug Valve

In a recent paper presented at a joint meeting of the Midland Junior Gas Association and the Wolverhampton and District Engineering Society, F. E. Varlow of the Audley Engineering Co. Ltd, described the design, operation, and advantages of the lubricated taper plug valve.

Special lubricants had to be evolved to suit extremes of operating temperature, to resist chemicals, and to allow easy turning. The lubricant may be fed to the valve by pressure screw or gun, but the film of lubricant is less than one thousandth of an inch thick.

A range of lubricants covers most needs but a separate lubricant has been developed for nitrating acid valves.

Three types of valve are produced, for pressures up to 10,000 p.s.i.g.; they may have manual, pneumatic, or electric operation, but all can be lubricated while in service.

Used chiefly in the gas, petroleum, and chemical industries, they also may be found in fire-sprinkler systems and heating circuits of buildings in hard-water districts.

Third Test Well in East Africa

BP-Shell Petroleum Development Company of Tanganyika Limited is to drill the third deep test well in East Africa at Mandawa, midway between Kilwa and Lindi on the southern coast of Tanganyika.

The drilling rig, as used on Mafia Island and Zanzibar, where test wells reached a depth of 11,051 and 14,281 ft respectively, is to be erected. A 20-mile all-weather road from the coast to the site is being constructed to carry heavy plant.

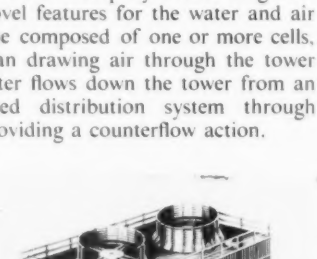
Survey work is being carried out in other areas of Tanganyika.

New Design Cooling Tower

Head Wrightson Processes Limited announce that work has been completed on a new design of their "Counterflo" induced draught cooling tower. This type of tower is widely used in the United States and the Company markets it in the United Kingdom and British Commonwealth under licence from the Fluor Products Company of Los Angeles.

The tower has some novel features for the water and air distribution, and it can be composed of one or more cells, each with an induction fan drawing air through the tower from louvre intakes. Water flows down the tower from an all-timber totally enclosed distribution system through splash-type grid decks, providing a counterflow action.

Prefabricated timber or concrete units are used for construction and these factory-made components can be erected on site by unskilled labour. Asbestos panels may be used as sheathing for towers in certain circumstances. Erection is rapid and simple and great flexibility is achieved in operation by individual cell control.



The towers are in use at oil refineries, chemical plants, and many industrial sites throughout Britain and overseas. Recently a concrete version of the tower was supplied to a Government Department to cool 4,000,000 gallons of water an hour. This is the largest installation of its kind in the United Kingdom.

The induced-draught tower is replacing the older hyperbolic or "milk-can" shaped natural draught towers, and its low height and unobtrusive appearance appeal strongly to architects and local planning committees.

British Building to House German Reactor

Whessoe Ltd, Darlington, are providing designs for the sealed building to contain a research reactor for the Federal Government of Western Germany.

The building, of 70 ft diameter and 67 ft high, is similar to that constructed by Whessoe at Harwell for the PLUTO reactor.

Designs were evolved in association with the U.K. Atomic Energy Research Establishment and the Ministry of Works.

Buildings at Dounreay, and in Australia, Denmark, and India, conform to these designs.

First BP Clyde Tanker Company Ship

The first ship of the recently formed BP Clyde Tanker Company has entered service. She is *Clyde Inventor*, previously *British Trust*, of 12,250-dw tons. She recently sailed from Falmouth to Ravenna.

Built in 1950 by Cammell Laird and Co., Birkenhead, she has Kincaid B. & W. engines.

The Economic Cost to Britain of Inadequate Roads

Road congestion effects in Britain have become so widespread that corrective action is urgent, stated C. T. Brunner, vice-chairman of the British Road Federation and a director of Shell-Mex and B.P. Ltd, in a recent paper.

The total cost to the nation through inadequate highways could not be less than £500 million per year, equivalent to financing the Royal Air Force.

Investment by private individuals in road vehicles had been considerable, and their number had risen from 3·7 million in 1948 to more than 7 million in 1957. Expenditure on road transport was more than 12 per cent of the national income. Gross capital expenditure on the roads to be authorized in the 1954–1962 Government programme was £450 million but actual spendings might decline after 1960.

The Road Research Laboratory estimated a traffic increase of 75 per cent, in as short a period as ten years.

Although Britain had the most serious traffic problem in Europe the amount spent on construction and maintenance of roads had been the smallest in recent years both per vehicle and as a share of the national product.

In regard to town traffic Mr Brunner thought that provision for private cars was essential to prevent a decay of life in the city centres. He advocated multi-storey garages and multi-level roads.

It was alarming to reflect that the City of London had in 80 years built no new main road, and work had started on only one! Vertical building work to the value of £32 million was, however, in progress.

If the average speed of commercial vehicles in towns could be increased even by 2 m.p.h. the savings would be immense; for instance the benefit in Birmingham was estimated at £2 million per year and in addition to the reduction in costs, much time would be saved and productivity would be raised.

BP Research now Concentrated at Sunbury

The move of BP's geophysical and petroleum engineering research station from Kirklington Hall, near Nottingham, to a new laboratory at Sunbury-on-Thames concentrates the majority of BP research at Sunbury. BP's palaentological laboratory has also been moved there from London.

The new laboratory block, part of Sunbury's current expansion programme, is a two-storeyed building with a floor area of 30,000 sq. ft. It contains much modern equipment and stands on the site of Meadhurst, the house purchased by BP in 1917 as its first research laboratory.

Kirklington Hall, which BP has occupied since 1947, is to be closed.

European Federation of Chemical Engineering

The Institution of Chemical Engineers has now joined the European Federation of Chemical Engineering.

The object of the Federation is "the furthering of European co-operation in the field of chemical engineering, which includes chemical apparatus and equipment, chemical process technology, materials as applied in the industry, and basic chemical operations."

The Federation now has Secretariats as follows:—

DECHEMA—Deutsche Gesellschaft für Chemisches Appatewesen—in Frankfurt am Main;

The Institution of Chemical Engineers, in London, and Société de Chimie Industrielle, in Paris.

Oil Gas Supply for East Anglian Towns

Two historic towns in East Anglia are the first in Britain to receive a gas supply entirely from oil, instead of coal.

They are Thetford, Norfolk, whose population of 4447 will be more than doubled under a London County Council "overspill" plan, and Brandon, Suffolk, six miles away.

Because the towns are in a sparsely populated area it was uneconomic to include them in the gas grid.

The Eastern Gas Board decided to install a Humphreys & Glasgow catalytic oil gas plant.

The plant converts heavy oil into gas, and was cheaper to install than a new carbonizing (coal gas) plant. It is expected to reduce the production price of gas by several pence per therm.

Entirely automatic, it can be controlled by one man, and has a capacity of 600,000 cu. ft a day.

The present output of the Thetford gas works is about 45 million cu. ft a year. Since demand is almost entirely during the day, the output can now be achieved by operating for two shifts, and the new plant is specially suitable for such intermittent operation.

The small gas works in Brandon is to be closed, and will be supplied from the new Thetford plant, through a six-mile steel main.

Work Starts on Grangemouth Refinery Expansion

Work has started on a £6 million expansion scheme at BP's Grangemouth refinery, Scotland, to increase processing capacity from 2·2 million to 3·1 million tons p.a.

A new crude-oil distillation unit, for which foundation work is proceeding, is to be erected. It will replace part of the present distillation plant.

Associated with the new distillation unit is a copper chloride unit, a de-ethanizer which will increase production of propane, and gas oil and kerosine treatment units. A new boiler and a 2250 kW electric generator driven by an experimental gas turbine will be installed in the power house. A number of tanks of various sizes, and extensions to present product-loading facilities will complete the project.

The new distillation unit is expected to be completed early in 1959 and the whole scheme later in that year.

Another Esso Super Tanker Launched

Esso Winchester, another in the series of 36,040-dw tons tankers now building for Esso Petroleum Co. Ltd has been launched from the Bremen yard of AG Weser where her sister ship, *Esso Guildford*, was launched last March.

The new vessel was named by Mrs Noble, wife of George Noble, O.B.E., a director of Esso Petroleum Co. Ltd. She is the third ship to be launched of a programme of eighteen super tankers, eleven of which will be of 36,040-dw tons, and the remainder of 47,400-dw tons. Options are held to increase the size of some of the vessels to 65,000 tons.

Esso Winchester will transport crude oil from Middle Eastern ports to the Esso Refinery at Fawley. She has an overall length of 690 ft, a beam of 90 ft, and a loaded summer draught of 35½ ft. Her service speed will be 17 knots and she will be capable of discharging her cargo in less than 9 hours at the rate of 4350 tons per hour through four pumps.

All the officers and crew will be accommodated in individual cabins. Spacious mess and recreation rooms are provided and there is also a swimming pool.

New Name for Australian Company

From 1 November The Commonwealth Oil Refineries Limited, one of the BP Group's oldest marketing associates, has been known as BP Australia Limited. The change is in line with the policy of the parent company, The British Petroleum Company Limited, to incorporate the BP name in all its subsidiary and associate companies throughout the world.

The Commonwealth Oil Refineries Limited was formed in 1920 when the Australian Government promulgated the Oil Agreement Act. Under this, C.O.R. became a 50-50 partnership between the Government and the Anglo-Persian Oil Company, as BP was then named. This arrangement continued until September 1952 when the Federal Government withdrew and BP became sole proprietor. Since the closure of its Laverton refinery in 1955 C.O.R. has remained a marketing organization. Kwinana refinery, Western Australia, is operated by another BP associate company.

N. R. Seddon, managing director of BP Australia Limited, has announced that under the new name the Company will continue its present policy of marketing a wide range of BP products throughout Australia.

BP Australia Limited has the largest marketing area in the BP Group, extending from Cocos Island in the west, Nauru Island in the east, Darwin to the north, and Mawson and Davis, bases of the Australian National Antarctic Research Expedition, in the south.

Mobil's New Medical Service

To make the maximum contribution towards the continued good health of its employees, Mobil Oil Company has recently extended its medical service by creating a central and co-ordinating medical department in London. Situated at 75 Victoria Street, S.W.1, the department is under the control of Dr W. L. B. Leese, M.A., B.M., B.Ch., M.R.C.P., the Company's chief medical officer.

The Company's medical service is supplementary to the National Health Service, and its policy is to assist management to select medically fit employees for the duties to which they are assigned, and to help maintain a high level of employee health and also healthy working conditions.

Equipment in the new department includes a diagnostic X-ray machine, an electrocardiogram, and laboratory facilities. There is a treatment room for first aid, physiotherapy, etc. The department provides a medical service for the London offices of all Mobil group companies.

The medical policy is carried out at the Company's Coryton refinery, and Birkenhead and Wandsworth works by local doctors who are in regular attendance.

Esso Education Foundation Grants 1957–58

The Esso Education Foundation has made 345 financial grants totalling $1,332,760 to educational institutions for the academic year 1957–58. This brings the Foundation's total grants in its three year existence to over $3,600,000.

In addition to the founder Company, Standard Oil Co. (New Jersey), contributors to the Foundation are Esso Standard Oil Co., Esso Shipping Co., Esso Research and Engineering Co., Esso Export Corporation, Interstate Oil Pipe Line Co., and The Carter Oil Co.

The grants represent an increase of 48 over those in 1957, and the District of Columbia and forty-two States which have private accredited colleges are included.

Unrestricted grants for undergraduate education totalling $726,000 are made to 282 colleges and universities, and research grants to twenty-two colleges amounting to $162,760.

Esso Employees Win Savings Cup

The Esso Purfleet Terminal National Savings Group recently won the Thurrock Area Industrial Savings Group Challenge Cup for the best savings record in the area.

This Cup is competed for by all local industries with over 301 employees, and includes all the companies on a stretch of over 18 miles of Thames frontage.

Savings at Purfleet Terminal have risen since 1952 from £462 to £4280. P. Bird, assistant chief clerk, has been secretary of the group for 15 years.

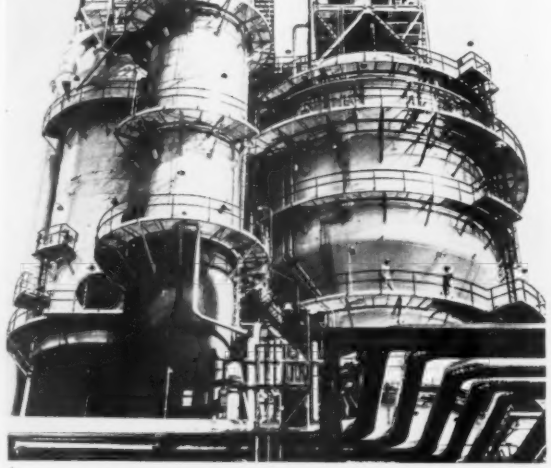
Expansion of Venezuelan Refinery

Each the first of its kind to be built in Venezuela, a new catalytic cracker and an alkylation plant were recently officially inaugurated by Dr Edmundo Luongo Cabello, Venezuela's Minister of Mines and Hydrocarbons, at Cardón refinery on the Paraguana peninsula. With a capacity of 33,000 b.d. the catalytic cracker will permit production of larger quantities of high-octane gasoline necessary for the modern high-compression engine. The alkylation plant, with an initial design capacity of 1400 b.d., will enable the highest quality aviation gasoline to be produced from 100 per cent indigenous materials.

Also under construction at this refinery, operated by Compañia Shell de Venezuela, is the fourth distillation unit, which will raise Cardón's total capacity to approximately 300,000 b.d., making it the most complete major refinery in Venezuela and one of the largest in Latin America. The total cost of these three plants will be almost £30 million.

Another recent development at Cardón was the completion in August of the 180-mile long 20-inch high-pressure gas line, which starts from the La Paz Concepción area west of the town of Maracaibo. This enables natural gas to be used for operation of the refinery, replacing liquid fuel which is now available for sale.

1957 marked the fortieth anniversary of Shell's refining activities in Venezuela, which commenced in the San Lorenzo refinery on the east shore of Lake Maracaibo in August 1917.



The new catalytic cracking plant at Cardón

Esso Safety Month Exhibition

During the month of October a comprehensive Safety Exhibition was held at the Esso Petroleum Company's Fawley refinery.

The opening of the exhibition coincided with the National Industrial Safety Week. The industrial section stressed the national theme "Guard your hands" and the special stands included displays of industrial safety gloves, protective clothing, machine guards, and safe working procedures.

A member of the Esso Safety Department said that only a few per cent of all industrial establishments in Britain were members of the Royal Society for the Prevention of Accidents, *i.e.*, about 2000 out of 80,000 firms. Injuries cost the nation about 18 million man-days' production every year, or in other words, one worker in thirty-one had an accident each year. In the United States the comparable figure was one in thirty-three. Britain led the world in accident-prevention legislation, yet Americans were more safety conscious! For example, the accident frequency rate in the U.S. steel industry was 7·2 compared with 32·6 in Britain! In the oil refining industry however, in the United Kingdom, the rate was on the average below 3.

The exhibition was not confined to safety precautions in refineries; it also emphasized the need for care in the home and on the roads.

Industrial, home, and road-safety films were shown in co-operation with RoSPA at the Esso cinema, Holbury, which is open to the public, and at the private cinema in the administration building. A very effective display was provided by the twenty-two stands, equipment for which was supplied by manufacturers of safety apparatus for the refinery, the Physics Department of Southampton University, the Southampton Accident Prevention Council, and various departments within the refinery.

Two competitions attracted special interest. They were the Children's Essay competition on road safety, and a free draw open to employees visiting the exhibition. The first was divided into three sections for different age groups, with cycles and cash prizes, and the second offered winners a trip to London with a visit to the Safety, Health and Welfare Museum in Westminster, safety shoes, and cash!

In the Road Safety Section a Talking Beacon and a Reaction Tester delighted children and their parents. Other popular items were the underwater swimming display, used to demonstrate the principle of compressed-air breathing sets, and the exciting fire-fighting and rescue demonstrations by the refinery fire brigade and medical department.

The technical stands showed precautions and safe working procedures, *e.g.* the hot-tap technique on pressurized lines, a range of defective tools, and a selection of beryllium non-spark tools.

The electrical stand contained exhibits loaned by the Factory Inspectorate Department of the Ministry of Labour and National Service. Among its notable features were a fluorescent lamp completely pressurized and driven by air turbines, a simple flash apparatus showing how flammable vapours can cause fires at points remote from their source, working models of floating roof and cone-roof tanks, a Wimshurst static electricity generator, and a model road tanker which showed the effects of static electricity and how it could be combated.

On other stands were a glass-distillation unit using a black heat mantle, models illustrating the effects of incorrect lifting postures, and a new form of unit scaffolding which eliminates clips.

On the clothing stand the PVC suits which give total protection, without discomfort from overheating because of their air circulation system, attracted much interest.

The exhibition was born from a suggestion by the Safety Committee under the chairmanship of Dr D. F. Jacques, assistant refinery manager. Taken up by the management and developed by the Safety Department, safety was sold not only to the individual employee, but to his whole family!

Attendance figures exceeded 4000, and the exhibition broke new ground in size, scope, and presentation.

U.K. Petroleum Statistics 1956

The Ministry of Power has recently published its statistical digest for 1956, which gives details of production, consumption, and utilization of all classes of fuel including petroleum, coal, electricity, gas, coke, etc.

In the petroleum section, details of supplies and demand are given over very considerable periods, and in some cases from 1920. A summary of the last three years is given in the accompanying table. In addition, tables are given of inland deliveries of gas diesel and fuel oils in terms of end uses and also for the years 1951–56 by two-month periods. There is also information regarding the number of persons employed in the distribution and refining of petroleum, and data regarding capital expenditure and the quantities and cost of purchased materials and fuel.

This publication is issued by Her Majesty's Stationery Office, the price being 17s 6d net.

	1954	1955	1956
	(Thousands of tons)		
Supplies of crude oil and shale oil:			
Imports of crude and process oils	28,074·9	27,853·8	28,643·4
Indigenous crude production	59·1	53·6	66·1
Indigenous shale oil ...	99·6	96·7	77·6
Total	28,233·6	28,004·1	28,787·1
Imports of crude and products:			
Crude and process oils ...	28,074·9	27,853·8	28,643·4
Aviation spirit	342·2	318·0	446·3
Motor spirit	1,036·6	1,504·1	1,594·2
Other spirit	162·9	116·6	160·0
Kerosine	1,303·9	1,542·3	1,396·3
Gas oil	1,400·5	1,904·2	1,947·6
Diesel oil	204·3	228·4	242·5
Fuel oil	1,648·1	2,405·3	3,170·3
Lubricating oils	468·0	451·3	460·5
Paraffin wax	40·2	37·6	33·6
Other sorts (a)	1·7	1·9	(b)
Total refined products ...	6,608·4	8,509·7	9,451·3
Exports, re-exports, and bunkers:			
Crude and process oils ...	24·1	68·4	(c)
Aviation spirit / Motor spirit ...	1,498·1	1,330·9	534·7 / 977·6
Other spirit	32·1	16·5	17·3
Kerosine	226·3	203·3	231·9
Gas oil	1,050·1	954·4	1,675·1
Diesel oil	417·8	400·4	462·6
Fuel oil	4,204·9	2,942·7	3,320·8
Lubricating oils	252·9	349·6	418·6
Paraffin wax	0·3	1·3	3·5
Other sorts (a)	101·5	7·3	76·3
Total refined products ...	7,784·0	6,206·4	7,700·4
Bunkers for vessels in foreign waters and for fishing vessels	3,851·2	4,073·8	4,435·9

	1953	1954	1955
Refining operations (including distillation plants):			
Throughput:			
Imported crude and process oils (d)	26,189	28,637	28,148
Indigenous crude ...	55	59	53
Indigenous shale oil ...	104	100	96
	26,348	28,796	28,297

	1953	1954	1955
	(Thousands of tons)		
Output:			
Aviation and motor spirits	6,312	7,221	7,220
Industrial and white spirits	245	280	295
Kerosine...	539	738	780
Gas/diesel oils	4,262	4,124	4,474
Fuel oil	11,117	11,939	10,776
Lubricating oils... ...	362	582	693
Bitumen	722	819	862
Butane	40	42	47
Propane	4	8	7
Miscellaneous products	381	553	513
Total	23,984	26,306	25,667
Refinery fuel (e) ...	1,513	1,830	2,055
Losses	519	598	557
Changes in unfinished stocks	+ 332	+ 62	+ 18

	1949	1955	1956
Overseas crude production by British and British-Dutch companies (f):			
Middle East:			
Egypt	1,735	1,281	1,047
Iran	26,807	7,508	12,493
Iraq	2,035	16,011	14,851
Kuwait	5,611	29,325	30,540
Qatar	—	2,601	2,704
	36,188	56,726	61,635
Far East and Australasia	6,327	10,727	10,996
India, Pakistan, and Burma	436	776	832
Europe (excl. U.K.) ...	451	681	718
Caribbean and South America:			
Argentina	512	394	399
Ecuador	348	401	384
Colombia	1,090	2,128	2,147
Peru	361	624	680
Trinidad	2,880	3,328	3,321
Venezuela	23,780	36,611	42,833
	28,971	43,486	49,764
Grand totals ...	72,373	112,395	123,945

(a) Excluding bitumen and petroleum coke

(b) Included in lubricating oils

(c) Included in other sorts

(d) Including distillation benzines

(e) Mainly fuel oil and refinery gases made and used in the same refinery

(f) Excluding production by British companies in N. America.

Personal Notes

Honour for Shell Photographer

Clive Cadwallader receiving the Hood Medal from the President of The Royal Photographic Society

Clive Cadwallader, who has been with the Shell Photographic Unit since 1946, has gained a coveted distinction by becoming the 1957 winner of the Hood Medal of The Royal Photographic Society.

The award is for meritorious performance in a branch of photography directed towards public service.

Mr Cadwallader's entries included coloured prints of stages in the life cycle of harmful insects, and it is in this type of work that he is making an important contribution to public health and prosperity in many parts of the world. His pictorial documentation is complementary to the research work of the Shell Agricultural Research Centre at Woodstock, where intensive study is made of harmful insects and weeds which, especially in tropical countries, cause serious damage to crops. As a result of these studies, insecticides and weed-killers of increasing power and selectivity are being developed.

Mr Cadwallader is a Fellow of The Royal Photographic Society and of the Institute of British Photographers.

News of the death at Houston, Texas, of **Ray Lofton Dudley** on 29 October 1957, at the early age of 66 will be received with sorrow by many oil men associated with some aspect of the petroleum industry. As President of the Gulf Publishing Company, he will long be remembered as a pioneer of high-standard petroleum publications, and the author of articles which so ably presented the aspirations and objectives of petroleum executive officers engaged in combating obstructive or political tactics damaging to the industry. From small beginnings, when Texas produced a negligible volume of oil, he built up a great publishing and printing establishment that concentrated on petroleum literature. Not content with Texan and U.S.A. oil news he created, through *World Oil*, an organization that ensured the receipt of all important oil news from correspondents located in most parts of the globe where oil was being produced or processed.

Acheson Industries (Europe) Ltd announce that **S. Mackenzie-Owen,** M.B.E., B. Comm., has been appointed unit manager of Acheson Colloiden N.V., Scheemda, Netherlands. He will assume full responsibility for the Dutch Company.

He first served with an engineering concern in Scotland, later joining David Brown and Sons (Huddersfield) Ltd, and subsequently being promoted to regional sales manager. He has been a sales executive with the Acheson organization for several years.

Mr Mackenzie-Owen was awarded the M.B.E. for work connected with reorganization of a number of REME workshops.

W. W. White has been elected a member of the board of directors of Esso Export Corporation, international marketing affiliate of Standard Oil Company (New Jersey).

Mr White, formerly a vice-president of Esso Research and Engineering Company, will be responsible for broad policy aspects of world-wide aviation marketing co-ordination for the company.

Mr White began his career in the Jersey family in 1930 in the sales department of what is now Esso Standard Oil Company. He was elected a vice-president of Esso Export Corporation in 1947, serving as general manager of the aviation department, and was named a vice-president of Esso Research and Engineering Company in 1956.

From 1942 to 1945 Mr White was on active military duty with the aviation supply department of the Petroleum Administration for War. In 1954 he was recalled to active duty, serving as staff director of the Petroleum Logistics Division of the Department of Defense until 1956. Mr White holds the rank of brigadier general in the army reserve.

R. E. Adlington, F.Inst. Pet., who for the past 10 years was in the Engineering Division of BP in London, latterly as manager engineering services, has been appointed chief engineer of BP refinery (Llandarcy) Ltd.

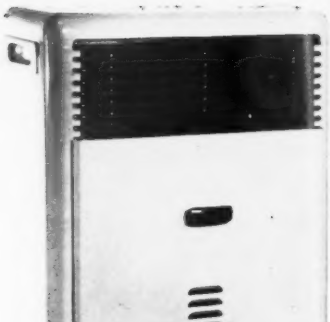
Sir K. B. Harper, A.M.Inst.Pet., has retired from the board of The British Petroleum Company Limited and **R. Paterson Smith** has been appointed to fill the vacancy.

Shell Art Exhibition

Michael Cameron and the winning picture

Opened by James Fitton, R.A., on 25 November and on view for a fortnight, the Sixth Annual Art Exhibition staged by the staff of the Shell Group in London contained ninety works in oils, water colours, and other media including one piece of pottery, a wood carving, and a sculpture. The quality of the work was excellent and the range of subjects diverse. The winner of a special award made by F. A. C. Guépin, a managing director of the Royal Dutch/Shell Group, for the best exhibit of any artist under 30 years of age, was Michael Cameron. He is employed in the Marketing Operations Division of The Shell Petroleum Co. Ltd and the winning picture was a pen and ink wash entitled *Mess Deck H.M.T. Samaria.* He also exhibited three studies in oils.

The Evolution of the Kerosine Convector



1953

It is about three-quarters of a century since John Harper & Company Ltd first started to manufacture oil heaters. The modern oil convector heater is a direct development of the well-known Beatrice heater originally developed in the early 1880s for the Company by C. R. Retallack. Among the many countries to which the Company are exporting stoves in considerable quantities are Kuwait, Iraq, Persia, and also the Near and Far East.

1889

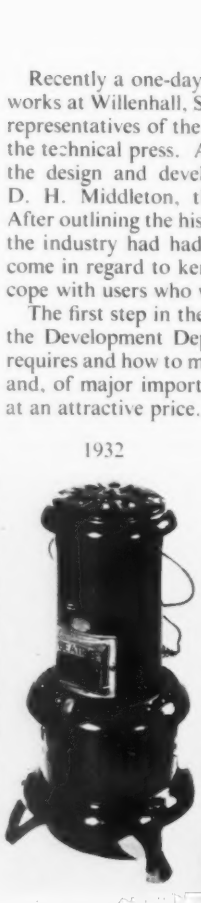
1900

1903

Recently a one-day conference was held at the Company's works at Willenhall, Staffordshire, and was attended by many representatives of the engineering and hardware trade and of the technical press. Among the papers discussed was one on the design and development of oil heating appliances, by D. H. Middleton, the Company's development manager. After outlining the history of the oil lamp, he pointed out that the industry had had many ill-informed prejudices to overcome in regard to kerosine-using appliances and also had to cope with users who would not read instructions.

The first step in the development of an oil appliance is for the Development Department to consider what the market requires and how to make it to meet standards of performance and, of major importance, to be attractive to the purchaser at an attractive price.

1932



1945

1947

Steps in oil heater design at Harper's

British Standard Specification 2049 laid down certain standards in regard to such appliances and it was their practice, said Mr Middleton, to regard these as minima. It was reasonable to suppose that an appliance with a basic performance much higher than the British Standard would maintain a high standard throughout its life.

There were fundamental limitations to the principles of kerosine burning which affected the design of an appliance. Thus, the limit of the distance the wick could lift the oil determined the height of the burner above the bottom of the tank. Also, the duration of burning affected the volume of kerosine and fixed the area of the tank base and consequently the size of the base of the appliance. Similarly, output rating was related to chimney height which, together with the size of the outlet grille, determined the height of the appliance.

On the question of what constituted good design, Mr Middleton reduced this to its simplest terms. He said that if it could be said that the product (a) fulfilled efficiently its proper function; (b) was made of the best material in the most economical manner; (c) was pleasing to the eye; (d) was easy to produce, pack and service; and (e) was at the right price; then the design was good.

Once a wooden model of the design had been approved, a prototype of the tank and burner unit was tested to check correctness of wick diameter, chimney height, etc. A sheet steel prototype of the case was then made and exhaustive tests started. Combustion must be perfect and tests were made to measure CO and CO_2 in the combustion products.

The flame must be stable in draughts and must not impinge on the surrounding burner components. It must not creep to a higher setting after a period of operation and must change quickly and smoothly from blue to yellow when it reached the turn-down position. It was in this position that maximum burner temperatures were obtained and these must be strictly controlled.

Rigorous testing of the wick is also necessary, as well as the investigation of oil and casing surface temperatures.

As the result of these initial tests it may be necessary to make minor modifications in the prototype and when these have been incorporated it is sent for costing. At this stage a second prototype is constructed and sent to the laboratory of one of the large oil companies for independent testing. Further prototypes are life-tested in the Harper laboratory.

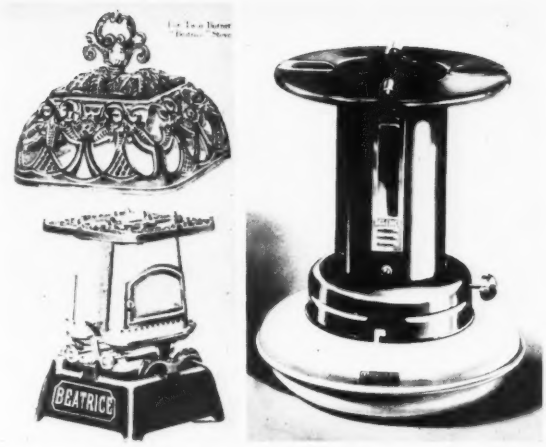
A batch of pre-production models is then made up and sent out for district testing under the Company's control. These models are given to people not necessarily familiar with oil heaters. Their comments are recorded and considered, concluded Mr Middleton.

The Foundry

Making kerosine-burning appliances is by no means the full extent of the operations of John Harper & Co. Ltd, and of their associated company John Harper (Meehanite) Ltd. Apart from the Finished Goods Department, in which oil heaters and stoves, gas appliances, and a wide range of domestic hardware are produced, the Company has two well-equipped and well-organized foundries.

The Grey Iron Foundry has been in existence since the Company was founded in 1790 and produces about 150 tons weekly of castings used in a multitude of different industries, including its own Finished Goods Department.

The Meehanite Foundry produces about 80 tons of high-duty castings per week, their size varying from a few ounces up to nearly 2 tons in weight. Meehanite is a comparatively new type of cast iron with considerable advantages for certain purposes over grey iron.



Boiling stove development

1889 1950

The Company also has excellent facilities for the application of high-class finishes to components. These finishes include polishing and electro-plating, hot-grease-tinning, spray painting, and vitreous enamelling.

Constantly researching into new materials and new methods, John Harper & Co. Ltd are now developing spheroidal graphite castings in conjunction with the Mond Nickel Company. Other developments in new methods are the hot blast water-cooled cupola, coil feed presses, and flow-line production of kerosine convectors.

A tour of the various parts of the large works at Willenhall impressed one with the facilities available for producing castings and similar manufactures for an extremely wide variety of industries.

★ ★ ★

CALOUSTE GULBENKIAN FOUNDATION GRANTS

The Calouste Gulbenkian Foundation, Lisbon, has announced a second list of grants totalling over £1 million. Of this about £500,000 is to be spent in the Middle East, for the benefit of projects in Iraq and of the Armenian communities there and in other parts of the Middle East, including Turkey. Another £500,000 is to be spent on projects in Portugal, the United Kingdom, and overseas parts of the British Commonwealth. These are the areas in which the Foundation is now operating.

Amongst grants for scientific, medical, and other research is one to the National Laboratory of Civil Engineering in Lisbon to build and equip a new research centre for fundamental research.

In education £15,000 has been set aside in the United Kingdom for three years to encourage co-operation between selected universities and teachers of mathematics, science, and technology to improve the quantity and quality of science teaching.

Scholarships for Iraqi technical students to study in the United Kingdom, and grants for Armenian and Portuguese students are included.

International Petroleum Equipment Conference

"Study Days at Stuttgart"

The Fédération Européene des Constructeurs d'Equipement Pétrolier—Federation of European Petroleum Equipment Manufacturers of which body The Council of British Manufacturers of Petroleum Equipment is a founder-member, is known in accordance with modern practice, as the FECEP–FEPEM.

The Federation is an extension on a European scale of the CBMPE and has its headquarters in Paris. The member countries are Belgium, France, Germany, Italy, the Netherlands, and the United Kingdom.

Its second International Technical Conference was held in Stuttgart on 10, 11, and 12 October to read and discuss papers on (A) Stainless Steels and Clad Steels and (B) Control Instruments, with particular reference to their application to the petroleum industry. In view of the number of papers available and the limited time for their presentation the two sections were run concurrently.

The Conference, known as the "Study Days at Stuttgart", was held in the Gustav Siegle Haus where there was headphone provision for English, French, or German as might be the requirement. The interpreters present were accorded a special note of appreciation on the termination of the proceedings.

The Conference was opened by speeches from the vice-president, G. Perret, and Dr Veit, the Minister of Economics of the State Baden-Wurtemburg.

The papers presented and a short summary of their contents are given at the end of this article. The references are FEPEM references. Any more complete information which may be required can be obtained from the Secretary of FECEP–FEPEM, J. P. Le Gall, 10 Avenue Hoche, Paris VIIIe.

The representation present, by countries, was Germany 68, France 44, U.K. 27, Belgium 17, Netherlands 14, Italy 9, Austria 4, Switzerland 3, and Sweden 1 or, with the ladies, approximately 200.

The social side was catered for by an Official Banquet in the Liederhalle on the Thursday, a Reception given by the Lord Mayor in the Liederhalle followed by a Concert on the Friday, and a Cocktail Party after the closing session on the Saturday. The concert was given by the well-known Stuttgart Kammer-Orchester under the direction of Karl Munchinger.

Works visits were laid on to the I.C. Eckhard A.G., or the Mercedes-Benz A.G. on the Friday. Visits and excursions for the ladies were a sight-seeing tour of Stuttgart, including tea in the restaurant 450 feet up in the Television Tower, and an all-day visit to Baden-Baden.

Recollections impressed on the memory include the following. Dropping from brilliant sunshine through fog to a first sight of Schipol runway when the wheels touched it. Stuttgart Airport blacked out with a consequent 140-mile coach trip from Frankfurt with the coach interior at tropical temperature. The first-class hotel stated to have been vacated by the U.S. Forces in May with no remaining sign of their occupancy. Stuttgart stretched over hill and valley with persistent fog in the valley. Considerable remaining evidence of war damage. The needle-like 600-foot concrete and steel television tower perched on a hill and at its base a new line in itinerant photographers with two lion cubs at the disposal of the subjects. The museum in the Mercedes-Benz factory with comprehensive exhibits from Daimler's first I.C. engine through the stage of his collaboration with Benz in the development of the motor-car chassis and coachwork to the monster which would have won the world speed record but for the war, and finally Stirling Moss' racer. Every engine and car in the museum stated to be in working condition. Visitors welcome at stated times any day of the week except Sunday. The ultra-modern Liederhalle with pleasing seating accommodation in the concert hall but with the general artistic conception difficult to appreciate. A German speaker referred to an item of curiosity as an air-conditioning unit and not an organ. The girl interpreter who after a ten-minute banquet speech in German gave the English version without hesitation and without reference to notes. Stuttgart Airport still blacked out involving a similar tropical coach trip to Frankfurt and finally the welcome sight of London Airport in brilliant sunshine on a Sunday morning. J.S.P.

Section A. Stainless Steels and Clad Steels

A.1.—"*The Use of Alloy Steels and Non-Ferrous Alloys in Oil Refineries and the Italian Production of these materials according to American Standards*". Professor Guiseppe Pastonesi, Polytechnic School, Milan.

Describes briefly various types of corrosion experienced in the equipment of a modern oil refinery and recommends the alloy steel or non-ferrous alloy best suited to meet each corrosion effect described.

Refers to the Jomini test for production of controlled-temper steels which can result in savings in usage of nickel and molybdenum.

Quotes corrosion test results on various alloy steels and non-ferrous alloys.

Records in tabular form the special alloy steels recommended for use in Italy since 1951 and some alloy steels and non-ferrous alloys produced in Italy according to American Standards.

A.2.—"*Problems Posed to Steel Makers by the Lacq Gas Field*". L. Colombier and J. Hochmann, Compagnie des Ateliers et Forges de la Loire.

Well No. 102 in the Lacq gas field produces natural gas with an H_2S content exceeding 15 per cent and a water-vapour content equivalent to 7 litres of water per 1000 cubic metres of gas. High-pressure and high-temperature production are involved. The presence of the H_2S under these conditions is believed to be the cause of sudden fracture of the well tubing through H_2S embrittlement.

Describes the research work carried out to produce an alloy steel to meet these abnormal corrosion conditions and to possess a yield strength higher than 56 kg/sq mm. Describes the resultant alloy steels, the test methods devised, and the alloy steel finally produced for the tubing now in service. In addition describes the alloy steel used for manufacture of the gate valves.

A.3.—"*Stainless Steels for Oil Processing Plants. Comparison between the Steels commonly used in Europe and in the U.S.A.*". Dr H. Schaeben, Mannesmann-Rohremberke A.G.

Compares the specifications of U.S.A. stainless steels with those of similar steels produced in other countries and shows that a certain degree of standardization exists. In the case of the commonly used stainless steels, especially when comparing American and German steels, there are only slight specification differences. When, however, steel types are considered larger differences are evident. For instance, the ratio between unstabilized austenitic steels and stabilized steels in the U.S.A. is 5 to 1 whereas in Germany just the opposite is the case. Enlarges on the reasons for this difference and especially on test methods which may give rise to it. Comments on the comprehensive ASTM standards and states that efforts have recently been made in Germany to establish a corresponding specification structure.

A.4.—"*French Stainless Steels Equivalent to ASTM Corresponding Steels*". P. Villain, Societé Metallurgique d'Imphy.

Reviews the different stainless steels (a) chromium, nickel steels, (b) chromium, nickel, molybdenum steels, made in the U.S.A. and the composition of which are given in the ASTM specifications. Outlines, when present, the composition differences for the different uses—sheets and plates, bars, or forgings, tubes, and castings and gives the corresponding steel types fabricated in France. Comments that the case of castings is easy to solve as such steel is always made to order.

A.5.—"*Electrochemical Tests of Corrosion and their Application to Corrosion-Resistant Steels*". J. M. Defranoux, Société d'Electro-Chimie, d'Electro-Metallurgie, et des Acieries Electriques d'Ugine.

States that electro-chemical tests allow each corrosion factor to be separated, allow the mechanism of its action to be analysed, and the limits of the damage it can cause to be determined in a given problem. This newly developed method is at present limited to the field of electro-chemical corrosion below about 300° C in the presence of ionized media. Indications are that in the future related methods will be developed for studying heat oxidation, the laws of which are determined by migration of ions across the oxide layer.

Gives a full description of the tests, states that in the mineral oil industry particularly the field for electro-chemical tests seems to be vast owing to their ease of application and their versatility, and ends on a note of caution that these techniques are in an early stage of development and depend on further research to definitely establish their importance and extend their possibilities.

A.6.—"*Clad Steels for the Oil Industry*". Dipl-Ing. Max Komers, Phoenix-Rheinrohr A.G.

Describes the three methods of bonding thin sheets of corrosion-resistant material to mild-steel plate (1) by welding shaped strips to the container's inner surface, (2) by spot welding the thin sheets to the M.S. plate before fabricating the container, and (3) by rolling and joining together in the mill the two plates of corrosion-resistant steel and mild steel to form the so-called clad plate.

Describes the method of welding clad plates together and indicates the difference between German and American practice.

Gives full description of the fabrication of 25 ft dia. x 120 ft high vacuum towers with some sections in 13 per cent chromium-steel cladding and other sections with 18/8 alloy cladding.

A.7.—"*Clad Steel Plates in the Petroleum Industry*". H. Lejay, Société des Forges et Ateliers du Creusot.

Defines "clad-steel plates" as bi-metallic plates in which union of the base metal and the cladding has been effected over the whole surface by hot working the two together, normally by rolling.

Describes the commonly used manufacturing process of symmetrical clamped packs built up with two steel base plates and two cladding sheets, the latter being inside the sandwich and separated by a refractory coating to prevent them from sticking together during rolling. The SFAC electrolytically deposit a fine film of nickel on the cladding sheets to give a better bond if these contain chromium. Also describes the welding technique for clad-steel plates and the advantages to be derived from their use.

A.8.—"*The Manufacture and Use of Clad Steels*". J. Erskine, Colvilles Ltd.

Details the advantages of clad-steel plates. Describes the double sandwich type of manufacture and several methods used for better bonding of alloys containing chromium.

Gives in tabular form the British equivalents of American clad steels and the British steels equivalent to the American specifications generally called for in backing steels. Deals with the mechanical properties of clad-steel plate, ultrasonic testing, gas cutting, cold working, hot forming, shearing and punching, and welding. Illustrates applications to the oil industry.

A.9.—"*Clad Steels for Heat Exchanger Tube Plates*". R. J. Anderson, Imperial Chemical Industries Ltd.

Describes the limited application of a different type of clad steels more often referred to as "bi-metal plates". This takes the form of circular plates of carbon steel clad with copper alloy for tube plates in heat exchangers. The maximum sizes are 1500 mm dia. by 150 mm thick. Covers the method of manufacture, the design of heat exchangers using bi-metal plates, the associated use of steel, copper alloy, or bi-metal tubes and seal welding the ends of the tubes into the tube plates.

A.10.—"*Corrosion and Heat Resisting Steels for the Petroleum Industry. A Comparison of British and American Qualities*". F. A. Kirk and J. Williams, Samuel Osborn & Co. Ltd.

The British equivalents to the ASTM qualities are given in tabular form, showing chemical analyses, heat-treatment, mechanical properties, and special test requirements where applicable.

The table has been divided into:—

(a) Low chromium steels (up to 9 per cent).
(b) High chromium steels (13 per cent and over).
(c) Austenitic chromium nickel steels.
(d) Special grades.

Under each heading the individual types of steels are listed and for each type the specifications, according to purpose or form, are quoted. Particular emphasis is placed on the specifications directly applicable to the petroleum industry, *e.g.*, the BS 1501 to 1506 series of steels is listed in preference to BS 970 EN steels, although a reference is made to most of the specifications for stainless steels.

The complexity of the subject is shown by the deviations in analyses required one from another.

Detailed physical characteristics of each of the steel types are given, together with an appraisal of their merits and a note of their applications in the petroleum industry.

Recent developments, such as extra low carbon 18/8 steels; austenitic chromium-manganese; chromium-manganese-nickel-nitrogen stainless steels and the precipitation hardening grades are discussed with their possible uses in the petroleum industry.

Charts are shown giving the behaviour of some standard materials in respect of resistance to scaling and strength at elevated temperatures.

The paper is illustrated.

The need for continued co-operation between the steelmaker and user in assessing new materials and in meeting the demands of exacting new processes is emphasized.

A.11.—"*Problems Arising from the Use of Stainless Steel in the Manufacture of Petroleum Equipment*". P. de Marneffe, S. A. Cockerill, Ougree.

Deals with the welding problems arising from the fabrication of thick steel plates, corrosion-resisting steels of various qualities, self-hardening steel, austenitic steel, and the alloys of copper and nickel.

Describes the fabrication of special storage tanks, the use of austenitic electrodes and the Brown Bovery weld test, the method of using the E.B. weld insert, the welding of the transition joints between steels of two different natures, the monel metal protection of heat exchangers, and the expanding of alloy steel tubes into the tube plates by the method of automatic retractive control. Fully illustrated.

A.12.—"*The Employment of Special Alloys and of Clad Steel in the Petroleum Industry and the Determining Factors in the Choice of Metals*". A. Demeure, Société Industrielle Belge des Pétroles.

Part I deals with

(a) Low-temperature corrosion arising from the sulphur, salt, and water content of the crude oil.
(b) Low-temperature corrosion arising from atomic hydrogen produced by weak acids in the oil.
(c) High-temperature corrosion principally H_2S derived from the various sulphur compounds in the oil.
(d) The various metals used to combat these types of corrosion.
(e) Follows the flow of the oil through a refinery and outlines the various types of protection adopted for storage tanks, distillation units, catalytic crackers, catalytic reformers, and catalytic desulphurization units.

Part II deals with the technique relating to the use of clad steels and inner linings.

Metallic

(a) Clad steels.
(b) Metallic linings.

Non-Metallic Refractory Linings

(a) Spraying silicon aluminous cements or those with a base of aluminate of calcium.
(b) Refractory linings in synthetic materials.

Section B. Control Instruments

B.1.—"*Electronic Instrumentation and Control Equipment for the Petro-Chemical Industries*". N. C. Warshaw, Eversheed & Vignoles Ltd.

Describes the principle of operation of an electronic control system embodying a novel and simple non-interacting three-term controller. Within this system is included a simple analogue computing device for the continuous solution of sum, product, addition, subtraction, and ratio problems met in many applications of automatic control. The possibilities of intrinsically safe equipment are described and reference is made to existing installations.

The principle of operation of an accurate liquid level gauge and transmitter for storage tanks is also described.

The various merits of the existing types of valve positioner for use with electronic systems are mentioned and reference is made to the particular advantages of electronic process control equipment where data logging techniques are to be used.

B.2.—"*New Types of Instruments Produced in Europe*". W. Barker, Elliott Brothers (London) Ltd.

Compares electronic and pneumatic transmission and describes the Swartwout system of electronic control which relies for its operation on the conversion of a 0/0·5 V signal generated by the primary transmitters.

Describes the advantages of a.c. systems, the new unitized version of the recorder/controller, the use of printed circuits, and the use of the curved chart plate to eliminate linearity producing linkages.

Deals with the differential transformer method of generating signals, the temperature transmitter, the pressure transmitter, and the level transmitter.

Describes the Bellows differential meter for the compution of flow in pipelines, the principle of its operation, and the methods used for temperature compensation and over-range protection.

Describes electrical weighing by means of the load cell, explains how it works, and gives examples of its use.

B.3.—"*Pneumatic Instruments of European Manufacture in Relation to those Specified by the U.S. Petroleum Industry*". G. A. Wapling, Taylor Controls Ltd.

Deals with the pneumatic instruments available in Europe for direct process control and the relative merits of the equipment available in relation to the requirements of the petroleum industry.

States that the instruments manufactured in Europe fall into three main categories:—

(1) European-manufactured international instruments.
(2) European designs of similar scope.
(3) Instruments for singularly European requirements

and gives the fundamental reasons for the differences that exist.

B.4.—"*Temperature Measuring Apparatus and Remote Control Apparatus Compared with other Systems*". R. Magni, Spriano S.p.A. Milan.

Describes the operation of pneumatic governors with special reference to the Sprianrector and the Microrela 58 and develops a mathemetical analysis of the performance of the Sprianrector universal governor.

B.5.—"*Electronic Weighing*". G. W. van Santen, S. A. Philips.

Describes the electronic method of weighing by the use of load cells. States that a standardized series of load cells is available for rated loads of 2, 5, 10, 20, and 50 tons and that shortly a new series will be available for load ratings of 50, 100, 200, 500, and 1000 kg. Suitable for weighing objects which could not or only at great expense be weighed by conventional methods such as tanks, bunkers, hoppers, and even complete furnaces the contents of which can be continuously weighed. Also platform weighing of heavy waggons, long pipes, and large castings. Constructional designs for direct weighing goods on crane hooks or on belt conveyors are in a final stage of development.

The guaranteed accuracy of the weighing installations described is better than 0·5 per cent. Under special conditions an accuracy of 0·1 per cent of the full scale value can be obtained.

Comment is made that the equipment is only suitable for use within a company as it does not conform to official regulations.

B.6.—"*French Manufacture of Measuring and Regulating Appliances for the Petroleum Industry*". G. B. de Livois, Controle Bailey.

Deals in a general way with the instrumentation in use in France and the progress made by French firms in its manufacture.

B.7.—"*The Examination of Longitudinally Welded Tubes*". A. de Sterke, Rongten Technische Dienst N.V.

Considers tubes of dia range 250 to 600 mm and thickness range 6 to 10 mm. Describes one method of manufacture and outlines weld defects which may occur.

States the methods available for checking the welds and describes in detail the ultrasonic method. Concludes that by this method it is possible to inspect the welds automatically at the welding speed or approx 1½ m per min.

Sets of the nineteen papers, in English, complete with a résumé of the discussions, are obtainable at a cost of £7 3s. per set from J. P. Le Gall, FEPEM, 4a bis rue Pasquier, Paris, VIIIe, or through the CBMPE, 2 Princes Row, Buckingham Palace Road, London, S.W.1.

Nuclear Engineering and Science Conference

At the Fourth Nuclear Engineering and Science Conference to be held from 17-21 March at the Chicago International Amphitheatre about 200 papers will be presented from the standpoint of engineers, physicists, metallurgists, and chemists,

The conference is designed to provide management with a comprehensive survey of progress being made throughout the world in development of low-cost nuclear power and other industrial uses of atomic energy.

Further details and advance programmes are obtainable from the Secretary of Engineers' Joint Council, 29 West 39 Street, New York 18, U.S.A.

Symposium on Instrumentation and Computation in Plant Design

The Institution of Chemical Engineers, The Society of Instrument Technology, and The British Computer Society are jointly organizing a symposium on "Instrumentation and Computation in Process Development and Plant Design", to be held in London in the summer of 1959.

Enquiries should be sent to The Institution of Chemical Engineers, 16, Belgrave Square, London, S.W.1.

The Branches Committee assembling for the November meeting at the Partington works of Petrochemicals Ltd

Around the Branches

BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD

South-Eastern Branch

During the summer three very successful visits were organized by the South-Eastern Branch. These were to the Esso refinery at Southampton, the British Railways Southern Region works at Ashford, and the National Physical Laboratory at Teddington.

On 4 June about a score of members and friends made their way to Southampton where they were met by a representative of the Esso Petroleum Company. On arrival at Fawley refinery they were introduced to their guide who gave them a short talk on the history of the refinery and the nature of the processes employed there. An excellent luncheon was followed by a tour of the refinery including visits to the fluid hydroformer, jetties, workshops, and the laboratories where the party was shown the latest analytical devices in operation. In expressing the thanks of the visitors for a most interesting and enjoyable day, the chairman of the South-Eastern Branch, A. H. Chatting, remarked that Esso had obviously put themselves out to make the visit a success—even to the extent of keeping cricketing enthusiasts posted on the test match score! Mr Chatting's speech received hearty endorsement from all those present, and a memorable day ended with the party returning to London in the same train as Princess Margaret who had been visiting Marchwood power station near Fawley.

The Ashford locomotive, carriage, and wagon works of British Railways, Southern Region, were visited on 10 July. The two dozen members and friends in the party were given a comprehensive tour of the works, and visited all departments in the 66-acre site. Although locomotives are no longer built there, the up-to-date facilities are fully employed on overhaul and repair; locomotives are completely stripped down and reassembled before being put back into service. The carriage and wagon works are engaged on new construction, the output of carriages being eight per week and of wagons about eighty per week, in addition to the repair of up to 200 wagons per week. The high output rates achieved in the works are in large measure due to the wide use of mechanization and mass-production techniques.

The third outside visit was on 5 October when fifteen members and friends visited the National Physical Laboratory at Teddington. It was impossible to cover the whole of the laboratory in the short time available, so the party visited only a few of the buildings. In spite of this it was possible to obtain a good idea of the scope of the activities of the laboratory. Among the items of interest in the Aerodynamics Department was the large "CAT" or compressed-air tunnel, together with some of the models which had been tested in it. In the Ship Testing Section the visitors saw the large water tanks

used to test the wax hull models, one of which was seen under construction. Other items of special interest included the High Voltage Laboratory, the Acoustics Laboratory, and the Creep Room; the party was also shown the electronic computer and atomic clock.

South-Eastern Branch Dinner Dance

On 15 November members and friends of the South-Eastern Branch, numbering over 200 in total, gathered at the Tudor House, Bearsted, for the annual dinner-dance. An excellent dinner was served and once this was over the chairman, A. H. Chatting welcomed the members and expressed the hope that they would enjoy the dancing which was to follow. There is little doubt that those present did enjoy the dancing, the music for which was provided by Joe Blake and his Westenders. Joe Blake spared neither himself nor his audience for he kept them on their toes almost continuously until 1 a.m., the only break being a short interval of about ten minutes just before midnight.

So successful was the evening that it was understood that the same band and M.C. have been reserved for the 1958 dinner-dance which it is hoped will be held again in mid-November.

At the South-Eastern Branch Dinner-Dance

Chairman of the Branch, A. H. Chatting (centre) *with Mrs and Miss Chatting, F. W. Martin, deputy chairman, and J. R. Moore, honorary secretary. The pictures below indicate how enjoyable the function was*

Northern Branch Comes of Age

"It was twenty-one years ago that Sir John Cadman delivered the inaugural address which started our branch of the Institute on its way," said **W. E. Huggett,** chairman of the Northern Branch, at the Annual Dinner on 8 November 1957. "Several present this evening were also present on that very auspicious occasion. This demonstrates the loyalty and continuity of membership which is very satisfying and typical of our organization. Of these stalwarts I should like to mention G. H. Thornley, F. Mackley, J. E. Haslam, and George Sell, the present editor of our publications."

Among those also present at the first meeting was the Lord Mayor of Manchester, and the chairman expressed his pleasure that again the Lord Mayor and the Lady Mayoress were present. He was also pleased to welcome Professor Frank Morton, whose presence was significant of Manchester's interest in petroleum engineering. He had visited the magnificent new School of Chemical Engineering and seen tangible proof of the efforts of the Technical College to add its weight to the development of that science and of the oil industry.

Welcoming also the representatives of all the U.K. branches of the Institute, Mr Huggett said: "The strength of the Institute must surely rest in the strength and activity of its branches."

The first branches were primarily concerned with the winning and refining of petroleum, but when the Northern Branch was started it was said that it would be more concerned with utilization. That term now had a much wider significance than it had twenty-one years ago. Within the last decade the oil industry had thrown out a new, strong, and healthy shoot in the petroleum-chemicals industry. Much of the pioneering work of that development was associated with Manchester. Mr Huggett was confident that if oil had to give way significantly to other sources of power, it would still have great importance as a supplier of raw materials for chemical processes.

The Northern Branch had been happy to see the rapid development of the Stanlow Branch, said Mr Huggett, and he hoped that efforts in Leeds would lead to the formation of an IP branch on that side of the Pennines. They should also encourage into their own branch local members of the oil and allied industries and he asked his audience to make a special effort to recruit more local candidates.

Mr Huggett then proposed the toast "The Institute of Petroleum".

W. E. Huggett (centre) *with two of the "stalwarts", F. Mackley and G. H. Thornley*

Guests at the Northern Branch Dinner were received by Mr and Mrs W. E. Huggett (left) *and Mr and Mrs G. H. Thornley*

G. H. Thornley, chairman of the Branches Committee of the Institute, thanked Mr Huggett for his toast and the company for their reception of it. The branches were an extremely important and very active part of the Institute. There were now thirteen branches—nine at home and four away. The Northern Branch was one of the oldest.

Welcoming the Lord Mayor, Alderman Leslie Lever, Mr Thornley congratulated him on the fact that it was twenty-five years ago on that day since he had first been elected a member of the Manchester Council. During that period he had served on many committees of widespread activity and had shown a special interest in welfare, the arts, and education.

Manchester's lead in the field of science was emphasized by the telescope at Jodrell Bank. The year 1957 was a great one for Manchester, for not only did it mark the coming of age of the IP Northern Branch and the Silver Jubilee of the Lord Mayor's councillorship, but also the centenary of the Hallé Orchestra. The latter indicated Manchester's lead also in the field of culture.

Another "stalwart", J. E. Haslam and Mrs Haslam (right) *with G. M. and Mrs Davies*

Concluding, Mr Thornley thanked the Northern Branch for inviting the members of the Branch Committee to be present that evening and said: "Mr Chairman and my Lord Mayor, you are rightly proud of your city and I share your pride in giving the toast 'The City of Manchester' ".

The Rt Worshipful the Lord Mayor of Manchester, **Alderman Leslie Lever,** J.P., M.P., LL.B., replying to the toast, said he was happy to be able to fulfil the tradition of twenty-one years by attending the dinner. He felt that tradition should be sustained and that the Lord Mayor should pay respects to an Institute which played so important a part in national and international life.

Manchester was a famous city. It had a wonderful university, of which he was very proud. The College of Technology was one of the finest colleges of science and technology in the world.

In conclusion, the Lord Mayor said he was happy to give honour from the City of Manchester to the Northern Branch of the Institute of Petroleum. He held the Northern Branch in great regard.

The success of the Northern Branch Dinner-Dance is obvious from these photographs taken by the IP editor

South Wales Branch

Owing to the unavoidable absence of the IP Branches' lecturer, A. C. Hartley, the meeting of the South Wales Branch on 10 October was addressed by the Branch chairman, Dr L. S. Thornes. His subject was "Impressions of a Visit to America."

The talk was supplemented by a number of colour slides taken by Dr Thornes.

The tour included New York, Chicago, Houston, Texas, and San Francisco, and in addition to visits to oil refineries, places of local interest had been visited.

Dr Thornes emphasized the importance of climatic conditions on the way of life of communities and said that only by visits to different countries could a better understanding be obtained between nations.

After an informal discussion the vote of thanks to Dr Thornes was proposed by A. Patrickson, works manager of the Llandarcy refinery.

Petroleum in Parliament

Production of Super-Tankers

On 22 November the Minister of Transport and Civil Aviation stated that there were at present 260 tankers of more than 40,000 tons building or projected on a world-wide basis and that 59 of them were of more than 60,000 tons.

Crude Oil Imports by Foreign Tankers

In a written reply on 20 November, Mr Neave, Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation, said that it was estimated that in recent months crude petroleum was imported into the United Kingdom in ships flying the flags of Panama, Liberia, Honduras, and Costa Rica at the rate of about 450,000 tons per month.

In a further reply Mr Neave stated it would not be in the best interests of British shipping to apply controls, based on the flag of the ship, to normal commercial operations such as the chartering of ships for the carriage of crude oil to the United Kingdom.

Books and Films

British and American Technical Book List

Data on more than 1200 British and American technical books, published or to be published between January 1957 and March 1958, form the contents of the current edition of *British Technical Books*.

This comprehensive catalogue, which has thirty-three classifications, not only gives the author, publisher, and price of the book, but also a short description of its contents.

Copies are obtainable at the price of 2s 6d post free, from the Publishers' Circular and Booksellers' Record, 92 Park Lane, Croydon, Surrey.

Careers for Girls in Engineering

The report of the Conference on Careers for Girls in Engineering, held last July in Coventry, has been published. It contains the full text of the speeches and discussion, and the closing address by the Minister of Labour and National Service.

Subjects dealt with include the opportunities offered in electrical engineering, government service, the aircraft, and the textile industries. Technical education is regarded as the gateway to opportunities, and the openings for graduates are examined.

Two papers describe the personal experiences of women in industry, one in civil, and the other in the field of electrical engineering.

Copies of the report can be obtained from The Women's Engineering Society, 25 Foubert's Place, London, W.1, at a price of 16s 6d post free.

Pride in Progress

An attractive booklet entitled *Pride in Progress* has been issued by Shell-Mex and B.P. Ltd.

It contains coloured illustrations and brief statistics on the eight refineries which the Company operates in Britain from that at Ardrossan on the Firth of Clyde to the Kent refinery in the Isle of Grain.

A colour film under the same title is also available from Shell-Mex and B.P. Ltd, Shell-Mex House, Strand, London, W.C.2.

The Rivers of Time

Over fifty centuries ago recorded history began in the land between the Tigris and the Euphrates when the first cities of the world were established by the Sumerians. Not only did history begin but also the development of the foundation of the present way of life. Later, in the Middle Ages, the Arabs entered the Middle East and provided a link between East and West. They passed the learning of the Sumerians on to the Greeks and on to the West and so laid the foundations for the Renaissance.

In the film *The Rivers of Time*, the Iraq Petroleum Company has brought to the screen a fascinating story of the achievements of the Sumerians and also of the Arab contribution to history. The inventive skill and the art of the Sumerians is astonishing when it is realized that it all happened six thousand years ago. And how true are the closing words of the commentary: "To-day, the heritage of six thousand years has returned to the land beside the waters where the record of history first began."

Running time for this Eastman colour film, which was made for IPC by the Film Centre Ltd, is 25½ minutes. It is available on loan from the Petroleum Films Bureau, 29 New Bond Street, London, W.1.

Test Flight 263

It is no great time since the pundits announced that for heavier than air machines speeds of over one hundred miles per hour were physically impossible. Then they proved conclusively that five hundred miles per hour was the absolute limit. Since then the maximum has increased steadily and to-day travel at speeds exceeding that of sound are commonplace in the air.

Yet, how few realize what has had to be done to achieve this. In *Test Flight* 263 we are shown in intervals during a normal test flight how the various fields of aeronautical research are constantly striving to solve the problems set them in the demands of high-speed flight. Metallurgists, aerodynamicists, designers, mathematicians, doctors, petroleum chemists and physicists, engineers, and many others are all striving to combat threats of metal fatigue, to overcome the effect of kinetic heat, to provide new fuels, to improve methods of take-off and of landing at high speeds, and so on. Not the least important is the human factor and the ability of the human body to stand the stresses to which it is exposed in high-speed flying. Human "guinea-pigs" work for periods in a temperature of over 200° C or are subjected to a force of 5g, *i.e.* five times the pull of gravity, while doctors study their reactions.

Under test at 5g

The film starts with a high-speed research aircraft (the Fairey Delta 2) taking off on a normal test flight and concludes as the machine lands again. As it lands, the commentator, addressing the pilot, says: "Your courage will be put to good account. The learning, the discerning, the planning, and the calculating will have reaped its reward".

Test Flight 263 is a British Petroleum Company film, produced by Ronald H. Riley and lasting for 38 minutes. It is available in both 35 mm and 16 mm versions and is one which should be seen by all who are interested in flight at any

speed. It can be obtained on loan from the Shell-Mex and B.P. Film Library as usual.

Forming of Metals

Practically the whole of the world's output of metal of about 350 million tons a year has to go through some type of forming process before it can be put to its ultimate use. The Shell Film Unit, in this excellent 28-minute colour production, brings to the screen an interesting and fascinating account of how the plasticity of metals is used to change their shape.

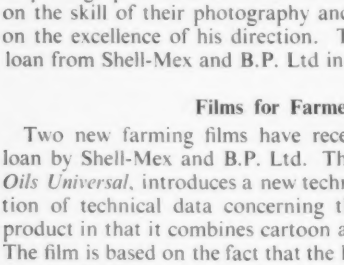
This film illustrates hot rolling, cold rolling, annealing, forging, tube and wire drawing, and extrusion, and there are some excellent close-ups of red-hot metals passing through slabbing mills, drop forges, press forges, and wire-drawing plants.

The "flying saw" cuts red-hot steel pipes

The petroleum industry's interest in steel is not only in obtaining its own requirements for refineries, tankers, pipelines, etc., but also in the lubrication of the machinery which produces the metal. The vital function of lubrication in this connexion is well shown in this film. Sidney Beadle and his co-photographer Eric Chamberlain are to be congratulated on the skill of their photography and Peter de Normanville on the excellence of his direction. The film is available on loan from Shell-Mex and B.P. Ltd in the usual way.

Films for Farmers

Two new farming films have recently been released for loan by Shell-Mex and B.P. Ltd. The first of these, *Tractor Oils Universal*, introduces a new technique into the presentation of technical data concerning the use of a petroleum product in that it combines cartoon and direct photography. The film is based on the fact that the half-million agricultural tractors in Britain need a lubricant which will be able to contend with the vagaries of British weather and then indicates how one grade of oil can be suitable for this purpose. To do this the audience is introduced to Farmer Brown, a cartoon character who has three tractors —one using diesel fuel, one vaporizing oil, and one petrol. At first he suffers from the trials and tribulations of selecting the right grade for the right machine at the right time. Later he is introduced to an oil which is claimed to serve all purposes at all times.



Three little tractors standing in a row

Produced in Eastman colour, running time is 18 minutes.

Farmers' Scrapbook No. 8, the second of the new films, covers a wide variety of subjects of interest to the farmer and stock breeder. Starting from Padstow on a May Day festival it records how sand is still collected from Padstow harbour and used to improve the tilth and remove acidity from Cornish soil. It also pictures the testing of a hydrostatically-powered tractor at the National Institute of Agricultural Engineering.

Of considerable value to the farmer and poultry breeder are the sequences illustrating the possibilities of the packaging of fresh vegetables and newly-killed poultry in air-sealed polythene packs. There is a wide market to-day, particularly in self-service stores, for goods so packed and the methods and machinery for so doing are featured.

De-aerating a polythene-packed chicken

For the stock breeder there are some interesting shots of the Aberdeen Angus breed of bulls for which Britain is the "stud farm of the world" and of the champion, *Ballot of Belladrum*. It is of interest to note that an American offer of £20,000 for this beast has been refused. His owner says that "He must stay in Britain."

Supreme champion Aberdeen Angus bull Ballot of Belladrum

Devised by R. F. Leach, produced by Peter Mills, and made for Shell-Mex and B.P. Ltd by Random Films Ltd, the running time is 22 minutes.

WORK BEGUN AT BP'S ANGLE BAY PROJECT

Following completion of preparatory work, major operations have begun on BP's deepwater tanker terminal at Angle Bay, Milford Haven.

The initial task is excavation in Popton Fort to accommodate the tanks for ships' bunker fuel and water supplies. The rubble removed will be used to form the bed of a road, about 1½ miles long, from Popton Point, near the shore of Angle Bay, to Kilpaison Farm. It is in the latter area that the marine crude-oil storage tanks will be located. Work on the foundations and safety bunds of these has also begun.

Site investigation involved marine borings on the site of the jetty, and the driving of a number of test piles, borings on the tank farm site, and hydrographic surveys of some of the rivers to be crossed by the pipeline from Angle Bay to Llandarcy refinery.

Exhibitions and Conferences

Fifth World Petroleum Congress New York 1959

The Board responsible for the organization of the Fifth World Petroleum Congress, which will be held in New York's Coliseum during the first week of June 1959, is as follows.

President

E. V. Murphree ... President of Esso Research and Engineering Co.

General Secretary

C. Eugene Davis ... Formerly vice-president of Shell Oil Co.

Members

Reid Brazell ... ... President and general manager, Leonard Refineries Inc., Alma, Michigan.
F. S. Clulow ... Recently retired vice-president of Shell Oil Co.
Ira H. Cram ... ... A director and senior vice-president of Continental Oil Co.
G. A. Davidson ... Vice-president and director of Standard Oil Co. of California.
H. W. Field ... ... Vice-president and general manager, Research and Development Department, The Atlantic Refining Co.
W. C. Kinsolving ... President of Sun Pipe Line Co. and Sun-Canadian Pipe Line Co.
Dr W. E. Kuhn ... General manager of the Research and Technical Department of The Texas Co.
John W. Mecom ... Houston, Texas.
Dr Jerry McAfee ... Vice-president of Gulf Oil Corporation.
E. B. McConnell ... Director and vice-president of Standard Oil Company (Ohio).
H. B. Nichols ... Senior vice-president of the California Texas Oil Co. Ltd.
Carl E. Reistle, Jr ... Director and executive vice-president of Humble Oil and Refining Co.
J. K. Roberts ... Director and vice-president, Standard Oil Company (Indiana).
Dr J. C. Zimmer ... Technical adviser, research department, Socony Mobil Oil Company, Inc.

A Programme Co-ordination Committee has also been set up under the chairmanship of J. K. Roberts and consists of nine directors, each responsible for the selection of papers for presentation in one section. They are:—

I. H. Cram ... ... Geology and Geophysics
C. E. Reistle, Jr ... Drilling and Production
H. W. Field ... ... Oil Processes and Refining
J. McAfee ... ... Chemicals from Petroleum and Natural Gas
W. E. Kuhn ... ... Composition, Analysis, and Testing
J. C. Zimmer ... Utilization of Oil Products
H. B. Nichols ... Engineering, Equipment, and Materials
W. C. Kinsolving ... Transportation and Distribution
J. K. Roberts ... Operations, Research, Statistics, and Education.

Concurrent with the Congress will be an exhibition covering the latest developments in all aspects of the petroleum industry. The exhibits, which will occupy the first and second floors of the Coliseum, will feature drilling, refining, and production equipment; research instruments and equipment; analytical, testing, and measuring instruments; transportation equipment; and the utilization of nuclear energy in the oil industry.

The date of the Congress will coincide with celebrations marking the centenary of the drilling of the first commercial oil well by Colonel Drake at Titusville, Pennsylvania, in 1859.

Instruments, Electronics, and Automation Exhibition

The Instruments, Electronics, and Automation Exhibition, to be held at Olympia, London in April 1958, will be almost one third larger in floor area than the 1957 exhibition. There will be more than 60 new exhibitors.

The 1958 Exhibition is international in character and in the overseas section, Belgium, Denmark, France, Germany, Holland, Sweden, Switzerland, and the U.S.A. will be represented.

A conference will be held concurrently with the Exhibition at Olympia, and scientists, engineers, and industrialists from the Continent, the Commonwealth, and the United States are likely to attend.

The exhibition is organized by Industrial Exhibitions Ltd, 9 Argyll Street, London, W.1, on behalf of the competing trade associations which comprise The British Electrical and Allied Manufacturers' Association, the British Industrial Measuring and Control Apparatus Manufacturers' Association, The British Lampblown Scientific Glassware Manufacturers' Association, the Drawing Office Material Manufacturers' and Dealers' Association, the Scientific Instrument Manufacturers' Association of Great Britain, and the Radio Communication and Electronic Engineering Association.

The Achema Congress

In conjunction with the European Congress of Chemical Technology in Frankfurt (Main) from 31 May to 8 June 1958 the following meetings will be held:—

The second congress of the European Federation of Chemical Engineering, which starts on 28 May in Brussels, will continue in Frankfurt on 30 May until 8 June.

The second congress of the European Federation of Corrosion will take place in Frankfurt from 31 May to 8 June. The theme will be corrosion and chemistry.

On 4 June the Gesellschaft Deutschen Chemicker will hold a special meeting to present awards for outstanding scientific work.

Nuclear technology will be the subject of the Dechema annual meeting on 3 June, and the "Isotopen-Studiengesellschaft" will hold its first annual meeting.

The programme of these events can be obtained from the Gesellschaft Deutscher Chemicker, Karlstrasse 21, Frankfurt (Main) or from Dechema, Rheingan-Alle 25, Frankfurt (Main).

National Power Farming Conference

Among the speakers at the seventh National Power Farming Conference, to be held at Cheltenham from 11-13 February, will be J. L. Hunt, technical manager of the Agricultural Division of the Shell Chemical Co. Ltd.

With "The Problem of Costs" as its theme, the Conference will discuss "High Production", "Production at Low Cost", "Making Machinery Pay", etc.

Further details are obtainable from The Conference Organizer, Practical Power Farming, Dorset House, Stamford Street, London, S.E.1.

Trade Literature, etc.

New Unit for Conditioning Transformer Oil on Site

The first complete mobile transformer-oil servicing unit to be operated in Britain has been put into service by Manchester Oil Refinery Ltd. It comprises a mobile test laboratory and transformer-oil processing plant designed to carry out degassing, dehydration, and filtration of insulating oil at site of erection of heavy electrical equipment.

It ensures that the properties of transformer oil remain at the highest possible level from filling to commissioning. On new equipment breakdown voltages of 80kV can be achieved after only comparatively short treatments.

Removal from oil of water which has accidentally entered the transformer, normally lengthy, tedious, and costly, can be effected in days instead of weeks and the breakdown voltage of the oil well can be raised in excess of the requirements of B.S.148: 1951.

The unit can provide the following services:

Filling *in situ* with new oil of transformers delivered under vacuum or gas-filled, with subsequent degassing, dehydration, and filtration to obtain maximum electrical properties of the oil.

The drying-out of large transformers by continuous circulation of the insulating oil under high vacuum and at high temperature.

Dehydration and refiltration by continuous circulation under vacuum, of transformer oil in existing transformers where justified by the condition of the oil.

The towing vehicle is fitted out as a mobile laboratory and can execute most tests required by B.S.148: 1951. In addition, water content by the Karl Fischer method, oil volume resistivity, and dielectric strength tests up to 80kV may be determined as necessary. The laboratory is under the control of an experienced chemist.

Matthew Hall Group of Companies

The chairman of the Matthew Hall Group of Companies, Bertram Baden, M.D., S.B.St.J., M.I.H.V.E., together with his fellow directors welcomed over 500 guests to their Annual Cocktail Party and Exhibition on 3 December 1957 at the Dorchester Hotel, London.

The wide range of activities of all branches of the Group was illustrated in the exhibition. Many photographs and models of large new buildings were shown and illustrated air conditioning, heating, sanitary and electrical, and fire-protection installations in large office blocks, hospitals, hotels, and other important buildings at home and abroad.

The heavy engineering section included examples of large mechanical, oil refinery, and chemical projects carried out by Matthew Hall and great interest was shown in erection work on one of the largest paper-making machines in the world, now in progress at Ellesmere Port.

The Group is actively engaged in many parts of the world and the exhibition was completed by a large selection of photographs which laid emphasis on Matthew Hall's expanding overseas activities.

Power Operated Valves

Details of valves operated by high-pressure air, hydraulic fluid, or electricity are contained in two new brochures issued by Audley Engineering Co. Ltd.

Control may be effected by push button, by a remote signal with manual return, or by a signal with automatic opening and closing of the valve.

There is a large range of models and special requirements can also be dealt with.

Copies of the booklets are obtainable from the Company at Newport, Shropshire.

Solvent Extractors and Analysing Machines for the Oil Industry

At the recent Exposition of Chemical Industries held in New York a special display of equipment and instruments was presented by Podbielniak Inc. of Chicago.

Prominent on the stand was the world's largest centrifuge, with a capacity of 90,000 gallons per hour. Although such contactors have been in use for several years in a number of industries none of such size had previously been exhibited. Podbielniak contactors or solvent extractors have been employed on rare earth extraction, waste-water contamination, aeronautical and marine fuel decomtamination, and with petroleum and petrochemicals.

A special application of the contactors was in a new continuous phenol removal process operated at the Weirton Steel Company, Pennsylvania. The process was the culmination of three years' work by Podbielniak in co-operation with the Wilputte Coke Oven Division of Allied Chemical & Dye Corporation, New York. The process removes greater quantities of phenol from plant waste liquors and uses less caustic soda per pound of phenol.

Significant reductions in the number of machines required for plant processing are provided by using contactors. In one case with a continuous lubricant treating plant, twenty-four centrifuges were replaced by four desk-size contactors which also give almost perfect extraction of impurities and corrosive materials in lubricating oils. The Company's contactor-Stratco reactor plants allow automatic operation and ensure accurate control of temperature, sludge separation, neutralization, and other process variables not previously feasible because of the awkwardness of former plant designs.

A range of instruments, known as Chromacons, is claimed to cover all requirements for accurate analysis from hydrogen t lubricating oils. They combine the principles of fractional distillation and vapour phase chromatography and can be used for analysis of gases, such as methane, propane, and butanes, liquids boiling below 175 C and liquids boiling at temperatures up to 350 C including fatty acids, petroleum liquids, etc. Efficiencies of 8000 + plate are claimed. Two models in the range are designed for field use and on-the-spot testing. Other models are portable units for use on the bench or table, and again a plate efficiency of more than 8000 is claimed.

Vapour phase chromatography has been extended to commercial application in the purification of rare products by the vapour phase chromaneer plant which provides a product of extreme purity, with automatic operation.

Also available is a range of low- and high-temperature distillation apparatus. The "Thermocon" is completely automatic, and is used for low-temperature distillation in the temperature range – 190 C to 20 C. A distillation can be obtained in 20 minutes with a distillation curve plotted automatically. In a recent comparative analytical accuracy survey by the Natural Gasoline Association of America the "Thermocon" was placed first. The high-temperature laboratory fractional distillation apparatus is marketed in four models in the range – 40 C to 350 C.

The combination of low and high temperature distillation, and the new analytical technique of gas chromatography represent a powerful battery of analytical instruments for analysis of any gaseous or vaporizable liquid mixture. Both methods have been extended beyond laboratory applications to pilot or small plant production in continuous automatic units. They have a multiplicity of uses, such as evaluation of crudes, cuts for octane and blend tests, experimental small-scale production of petroleum chemicals, and purifying of highly refined essential oils.

Mobile Units to Speed Fencing Service

Boulton and Paul of Norwich, manufacturers and erectors of fencing, have introduced an Erection Service Organization of mobile teams of qualified Fence Erectors working from bases throughout Britain. Distribution centres at Norwich, London, and Birmingham ensure supplies of components to sites on time and the work has been reorganized to line up with the new manufacturing programme.

New Positive Feed Distributors

C. C. Wakefield & Co. Ltd have produced a booklet describing in detail operation of their new types PF and PFL oil and grease distributors.

The distributors are capable of receiving a continuous supply of lubricant from a single inlet, and then feeding it to a number of additional points in equal quantities. They can operate satisfactorily when fed either by grease gun or mechanical lubricator.

Copies are obtainable from P.D. Dept, Wakefield-Dick Industrial Oils Ltd, Grosvenor Street, London, W.1.

High-Temperature Heating Plants

A very successful Continental system of high-temperature heating has been introduced to the British market.

The system permits automatic control to within 1° C to 2° C of any temperature up to 370° C. A series of vessels can operate simultaneously at temperatures between 60 and 70° C using only one boiler in a closed circuit without loss of heating fluid. Pressures do not exceed 80 p.s.i.g., so that most existing plants can be coupled up without alteration.

Manufactured under licence from Hch. Bertrams Ltd of Basle, the plants are handled in Britain by Rose, Downs, and Thompson, Ltd, Old Foundry, Hull, from whom flow sheets and data may be obtained.

Mobile VHF Radio to Speed Oil Operations in Kuwait

The Kuwait Oil Company has ordered VHF radio-telephony equipment to the value of about £23,000 from Marconi's Wireless Telegraph Co. Ltd.

This equipment will maintain two-way contact between vehicles in the field and the Company's local headquarters.

The Company's road fleet of 37 vehicles will be divided into four sections, the drilling unit, the engineering unit, the production unit, and the transport and fire-fighting unit, each vehicle being equipped with a 10 W transmitter/receiver.

There will be three fixed stations, at Ahmadi, Raudhatain, and at the seismic camp.

The Ahmadi site will have five transmitters and five receivers, each pair working on a separate frequency. No. 1 will handle communications with the drilling unit, but can also switch to the engineering unit frequency, and will be operated from the office of the Drilling Engineer. No. 2, primarily for the engineering unit, but also available for the drilling unit, will be controlled from the Engineering or Roads Offices. No. 3, used by the Production and Pipeline Offices, can be employed on communications with the production or transport and fire-fighting units. No. 4, controlled from the Transport Office, will normally be used with the Production unit. No. 5 is a spare.

The vehicle-carried equipment can contact any of the departments of the three fixed stations within range. New instructions can therefore be issued to vehicles without return to base, and many thousand vehicle miles can be saved.

Errors in Computing

Over 200 members attended the first meeting in London of the British Computer Society Ltd, at which Professor D. R. Hartree gave examples of errors that can occur in computing processes in a paper entitled "The Machine's Eye View".

He mentioned that in a hand computation an intelligent and experienced computer could often predict the pattern of the calculations, but a machine lacked that background of experience and knowledge.

Machine errors were not the only cause of wrong results; they might be attributable also to supply of wrong data or programme mistakes. Adequate checking information given to a machine was vital, and individual programming had to be used.

The user of a machine must understand how and what to programme to achieve the desired results, and that a machine could not deal with a situation by itself, unless it had been supplied with appropriate instructions.

Netherlands Oil Equipment Manufacturers' Catalogue

A very attractive and informative volume for all connected with the supply of equipment for the myriad needs of the oil industry is the 1957 catalogue issued by the Netherlands Oil Equipment Manufacturers.

The 284 pages of this second edition of the catalogue cover every type of product marketed by the major oil equipment firms in Holland. The classified index lists items as diverse as high-strength bolts and boilers, machine screws and prefabricated buildings, oil burners and industrial cranes, and diesel engines and barges.

In addition to a large number of photographs of machines and apparatus, there are many fine sectional drawings, diagrams, and tables.

The catalogue is completed by a comprehensive set of conversion tables, based on customary standards such as the ASTM/IP, and includes such unusual units as the Russian arshin (28 inches), the Malayan catty (1·33 lb.), the Iranian farsang (6·24 km), and the Japanese kan (8·25 lb.).

It is published by the Secretariat, NOEM, The Hague, Holland.

New Domestic Oil-fired Boiler

A new boiler meets the need for an automatic oil-fired boiler of relatively low output for the central heating and hot-water requirements of the average four-bedroom house.

The boiler is competitively priced, its installation is simple and inexpensive, and it uses 35 second oil, the cheapest domestic heating fuel.

The boiler, of cast-iron, forms a complete unit with integral draught stabilizer, pressure jet burner with photoelectric control, and thermostat. The burner and controls are pre-wired ready for assembly. The whole unit is enclosed in an enamelled sheet steel case in a choice of colours.

Further details are obtainable from Thomas De La Rue & Co. Ltd, 84–86 Regent Street, London, W.1.

Forthcoming Meetings

THE INSTITUTE

(*At* 61 *New Cavendish Street, London, W.*1., 5.30 *p.m.—tea* 5 *p.m.*)

Mechanism of Sludge Suspension in Engine Oil. P. J. V. Agius, B.Sc., Ph.D., A.R.I.C., and D. Mulvey, B.Sc. **5 February**

(*At the Institution of Electrical Engineers, Savoy Place, London, W.C.*2, 2.30 *p.m.*)

Symposium on Insulating Oils **5 March**

IP ECONOMICS AND OPERATIONS GROUP

(*At* 61 *New Cavendish Street, London, W.*1., 5.30 *p.m.*)

Energy Studies. Dr R. Regul **9 January**

The Fuel Economics of Public Road Transport. A. T. Wilford. **13 February**

Development of Nuclear Power. J. A. Jukes. **13 March**

IP ESSEX BRANCH

(*At the Railway Hotel, Pitsea,* 7 *p.m.*)

Annual General Meeting. Address by Bernard Braine, M.P. 7.30 p.m. **10 January**

IP ESSEX BRANCH

(*At "Shell" Club, Corringham*)

Annual Dinner Dance. **18 January**

(*At the Railway Hotel, Pitsea,* 7.30 *p.m.*)

Liquefied Petroleum Gas. K. R. Garrett, M.Sc., F.R.I.C., A.F.Inst.Pet. **14 February**

Recent Developments in the Gas Industry. L. J. Clark, B.E.M., M.Sc., M.I.Mech.E., M.Inst.Gas E., A.M.I.C.E., A.M.I.E.E., M.I.Chem. E., A.F.Inst. Pet. **28 February**

Operation of a Small Refinery in the U.K. A. Cluer, B.Sc., A.R.I.C., A.M.I.Chem. E., M.Inst.Pet. **21 March**

IP FAWLEY BRANCH

(*At Esso* (*Fawley*) *Recreation Club, Holbury,* 7.30 *p.m.*)

Super Tanker Construction. T. B. Hutchison, M.I.Mar.E., A.I.N.A. **17 January**

Annual General Meeting and Film Show. **14 February**

Joint meeting with the Royal Institute of Chemistry

Non-destructive Testing of Materials. J. R. Baddiley, B.Sc. **14 March**

FORTHCOMING MEETINGS (*continued from page* 35)

IP LONDON BRANCH

Dinner Debate. **21 January**
(*At* 61 *New Cavendish Street, London W.*1., 6 *p.m.—tea* 5.30 *p.m.*)
Annual General Meeting
Additives for Lubricants. G. H. Thornley, M.Sc. **26 February**
Luncheon Meeting. **19 March**

IP NORTHERN BRANCH

(*At Engineers' Club, Albert Square, Manchester* 2, 6.30 *p.m.*)
Linear Programming. **21 January**
Using Films in the Oil Industry. R. F. Leach, M.A. **11 February**
Oil Transportation. The Right Hon. Lord Geddes **18 March**

IP SCOTTISH BRANCH

(*At North British Station Hotel, Edinburgh*, 7.30 *p.m.*)
Annual General Meeting. Staff Training. Member of BP Staff. **23 January**
(*At Recreation Hall, BP Grangemouth Refinery*, 7.30 *p.m.*)
Using Films in the Oil Industry. R. F. Leach, M.A. **20 February**
Joint Meeting with Stirlingshire and District Section of R.I.C. and S.C.I. **20 March**

IP SOUTH-EASTERN BRANCH

(*At the King's Head Hotel, Rochester*, 7.45 *p.m.*)
Off-shore Drilling. R. Bonafont, B.Sc., A.M.I.C.E.
Films: *If the Cap Fits*
The Oil Rivers **4 February**
(*At Medway College of Technology*, 7.45 *p.m.*)
Joint Meeting with Royal Institute of Chemistry **4 March**

IP SOUTH WALES BRANCH

(*At the Training Centre, BP Refinery* (*Llandarcy*) *Ltd*, 5.30 *p.m.*)
Annual General Meeting and Debate. **13 February**
Joint Meeting with the Institute of Fuel
Oil Fuel Applications with Special Reference to South Wales. T. Chippindale, A.M.I.Chem.E., M.Inst.F. **13 March**

IP STANLOW BRANCH

(*At Lobitos Club, Ellesmere Port*, 7 *p.m.*)
Annual General Meeting and Film Show **15 January**
(*At the Grosvenor Museum Lecture Theatre*, 7.30 *p.m.*)
Joint Meeting with the Royal Aeronautical Society
Aircraft Fuelling Problems. E. L. Bass, M.I.Mech.E., F.R.Ae.S., F.Inst.Pet. **12 February**
(*At Blossoms Hotel, Chester*, 7.30 *p.m.*)
Joint Meeting with The Institute of Fuel
Coal and Oil as Partners in Energy Supply. R. R. Gordon, M.A., Ph.D. **19 February**

OTHER SOCIETIES

SOCIETY OF CHEMICAL INDUSTRY—ROAD AND BUILDING MATERIALS GROUP
(*At* 14 *Belgrave Square, London, S.W.*1.)
Some Factors Influencing the Behaviour of Bitumen Road Surfacings. G. M. Dormon and A. W. Jarman, B.Sc., A.R.I.C., F.Inst.Pet. **20 March**

SITUATIONS VACANT

JUNIOR PETROLEUM ENGINEER REQUIRED

by large oil company for general field work in Middle East including well-testing and drilling mud control. Applicants, under 30, must be single or prepared for initial separation and should have university degree in mining, oil technology, chemical engineering, physics, or mechanical engineering. Three months paid home leave is given for every two years served. Gross pay over £1600 per annum tax free. Apply, quoting No. 723, to Box No. 1305, c/o. Charles Barker & Sons Ltd, Gateway House, London, E.C.4.

GEOPHYSICISTS

Major oil company requires, for work in the Middle East, several geophysicists under 40. One senior man capable of supervising work of several field parties. Two or three junior men are required in addition. Applicants should be graduates in physics or geology. Over three months paid home leave after each two years of service overseas with free air passages. Air-conditioned fully furnished accommodation at reasonable rental. Bachelors preferred owing to shortage of accommodation, but married men considered if prepared for initial separation. Pensionable salary according to qualifications and experience; not less than £1600 for senior geophysicists and £1100 for junior geophysicists, plus large local currency allowance from which total substantial savings could be made. Write in detail, quoting No. 737, to Box No. 1306, c/o. Charles Barker & Sons Ltd, Gateway House, London, E.C.4.

GEOLOGIST

With good university degree, under 35, required immediately by major oil company for work in the Middle East. Pensionable service on three year contract with paid home leave for every two years served overseas, with free air passages. Bachelor preferred owing to shortage of accommodation. Pensionable salary, plus large local currency allowance. Reply in detail, quoting No. 738, to Box No. 1308, c/o. Charles Barker & Sons Ltd, Gateway House, London, E.C.4.

MECHANICAL ENGINEERS FOR MOTOR VEHICLE TECHNOLOGY

The Associated Ethyl Company Limited has vacancies at its Engine Laboratory, Bletchley, for mechanical engineers for experimental work on motor vehicle and engine testing.
Applicants should be university graduates or associates of a Corporate Institution. However, consideration may be given to candidates who have not the qualifications but are of equivalent standard and have had suitable experience.
Some assistance may be given to married men towards helping them change their location.
The Engine Laboratory is situated in pleasant rural surroundings close to the development town of Bletchley. Transport is available to and from the Engine Laboratory and there is a company operated pension scheme.
Applications should be sent to:—
The Manager,
The Associated Ethyl Company Limited,
Engine Laboratory,
Watling Street,
Bletchley,
Bucks.

Independent petroleum marketing company requires fully qualified and experienced manager for their London Lube Oil Department, familiar with export marketing and technical service. Replies with full details to Box 1120, *IP Review* will be treated in strictest confidence. This advertisement is known to the present staff of this company.

ENGINEER offers services. Many years experience oil and water development. Fields and manufacturing in U.K., U.S.A., Middle East, India, etc. Available immediate engagement. Member API, Inst.Pet., and OIC. Box No. 1119, *IP Review*.

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of companies
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Telephone: RELiance 7141. Cables: Geoprosco, London.
AND SUBSIDIARY COMPANIES IN
TORONTO · CALGARY · CASABLANCA · MADRID · PARIS

BENZOLE

the spirit of British Industry

Benzole, the all-aromatic hydrocarbon, is made here in Britain by our own basic industries. For benzole, the essence of coal, is produced wherever coal is carbonised—at collieries, at gas works, and at our great iron and steel works.
Benzole is the spirit of British Industry. It is also the basis of two powerful motor spirits—

NATIONAL BENZOLE MIXTURE *and*

SUPER NATIONAL MIXTURE

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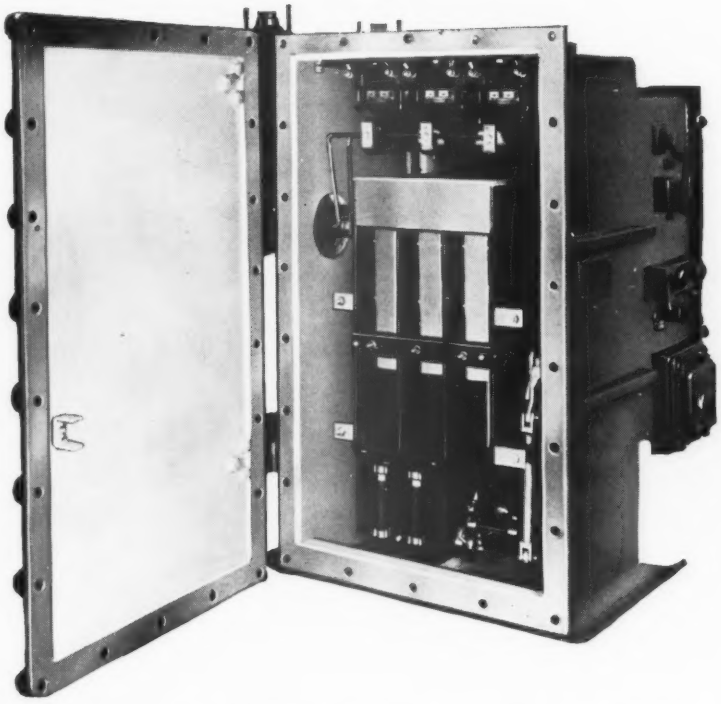

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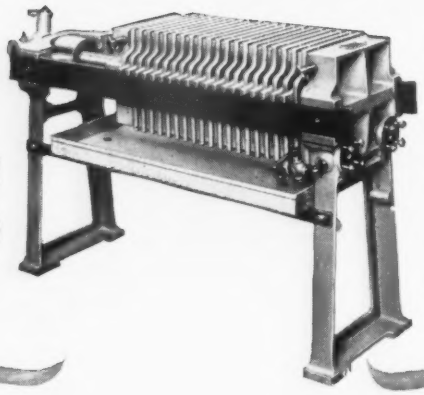

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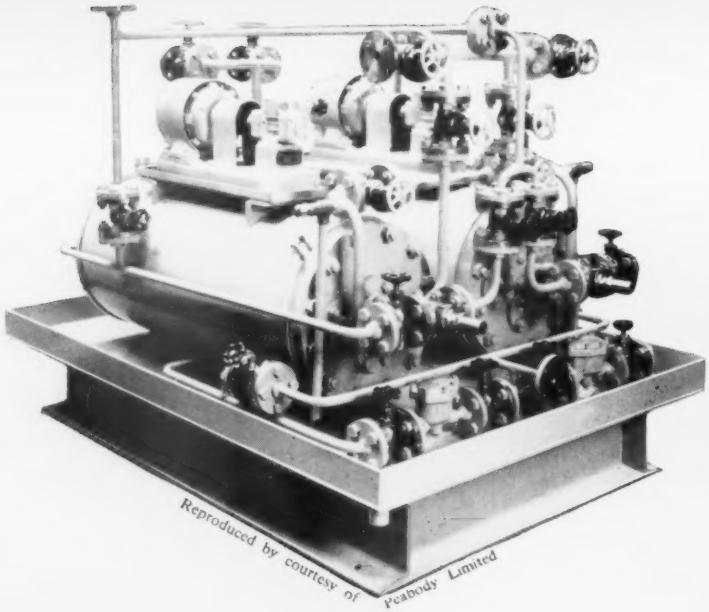

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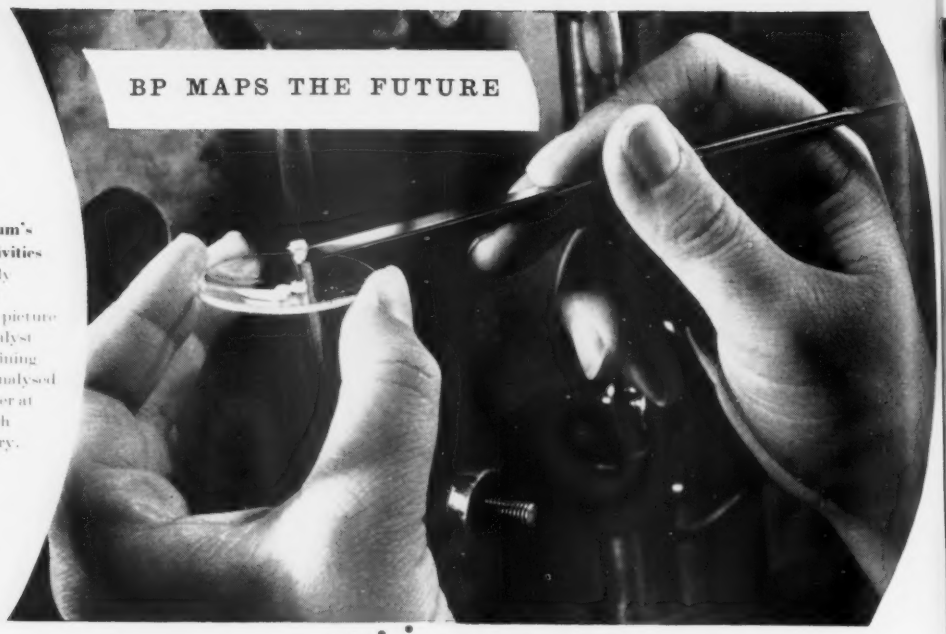

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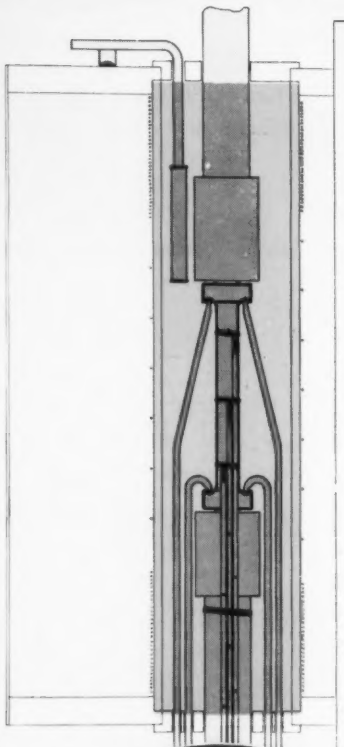

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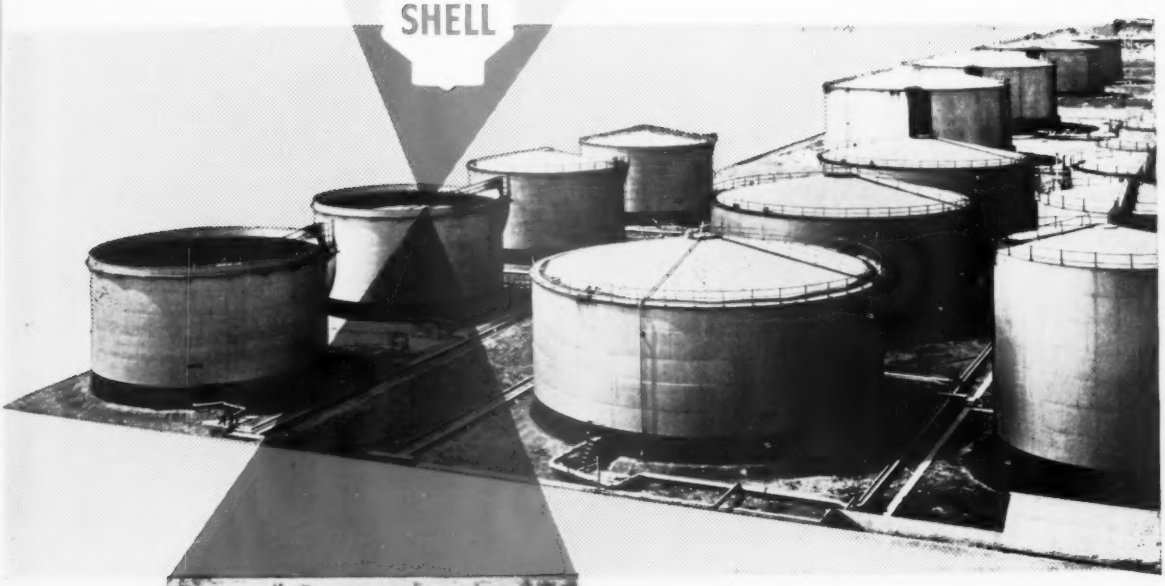

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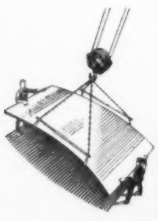

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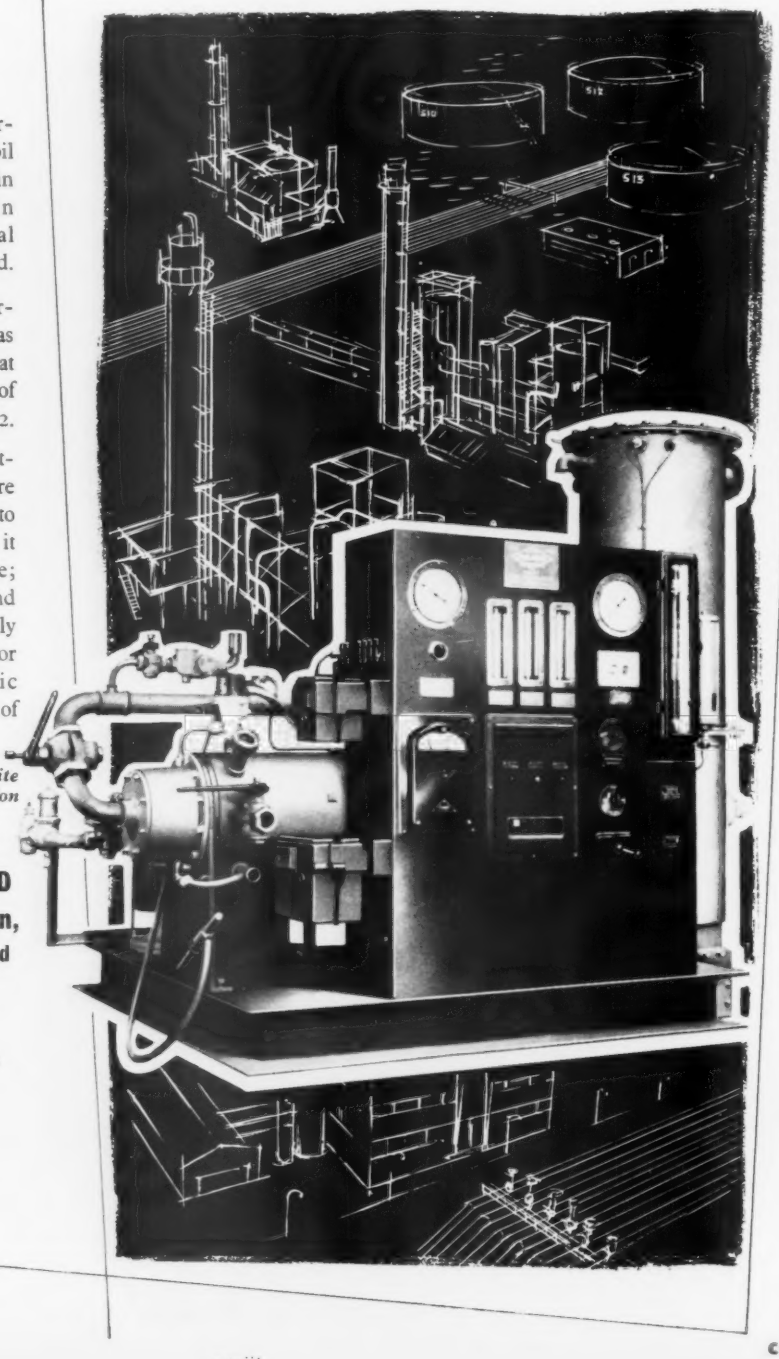

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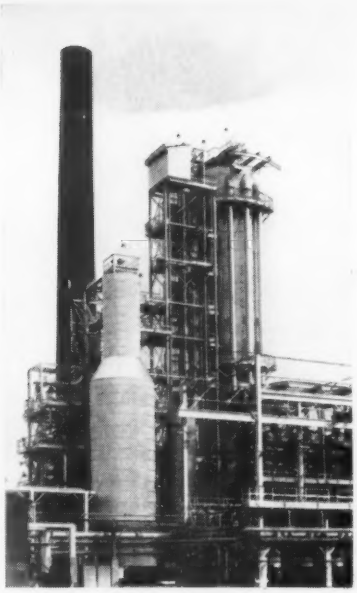

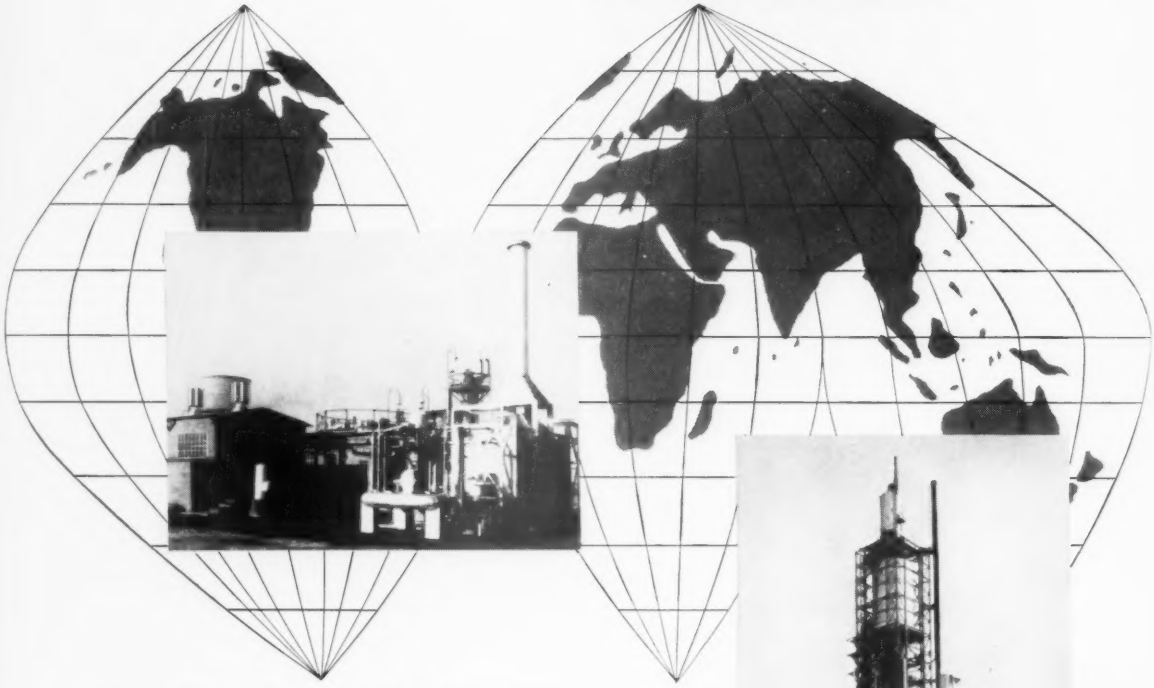

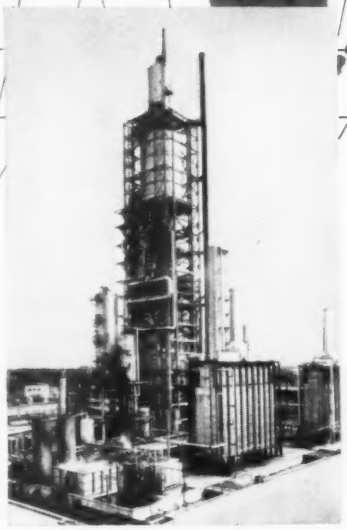

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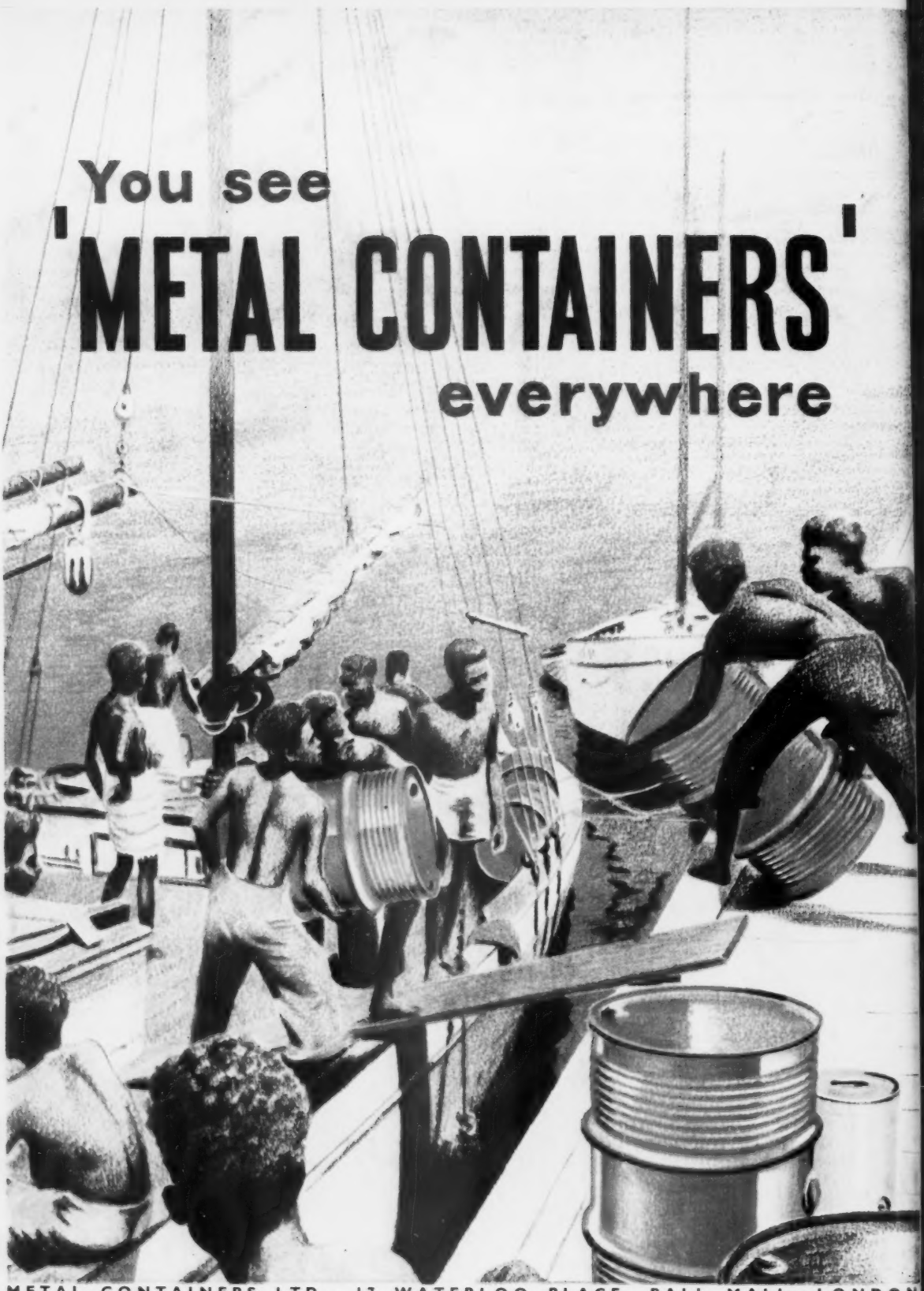

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